pp. 285–358] [May, 1942

TROPICAL DISEASES BULLETIN

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Main Contents:

SUMMARY OF RECENT ABSTRACTS:
IV. TRYPANOSOMIASIS.

MALARIA. PLAGUE.
AMOEBIASIS.
BACILLARY DYSENTERY.
GENERAL DEFICIENCY DISEASES.
BERIBERI.
PELLAGRA & ALLIED CONDITIONS.
EPIDEMIC DROPSY.
RELAPSING FEVER.
RAT-BITE FEVER.
LEPTOSPIROSIS.
MISCELLANEOUS.

For detailed Contents see pp. ii, iv, v & vi.

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BUREAU OF HYGIENE AND TROPICAL DISEASES

TROPICAL DISEASES BULLETIN.

Vol. 39.] 1942. [No. 5.

SUMMARY OF RECENT ABSTRACTS.*

IV. TRYPANOSOMIASIS.

Epidemiology.

In Nigeria, during 1939, WALKER (p. 631) reports that of almost 500,000 persons examined, 4 per cent. were found to be infected. Previously diagnosed cases are evidently not included in this figure and the total incidence is stated to have been about 6·7 per cent. In miners of the Kabba-Ilorin goldfield the infection rate is as high as 40 per cent., but in the Zaria Emirate it has fallen very greatly in recent years; it is the latter area in which mass campaigns have been conducted since 1933. In the endemic areas of Belgian Congo VAN HOOF (p. 631) reports that during 1939 more than 5,000,000 natives were visited, that 12,886 new cases were diagnosed and that 40,510 old cases were kept under control.

In Nyasaland LAMBORN (p. 72) has investigated the incidence of sleeping sickness by the examination of blood from all available persons in one area, but recognizes that concealment of cases may have taken place. Along the lake shore, where conditions suitable for food cultivation are good, and along the rivers of the south, where there is extensive cultivation of broad stretches of land, conditions are unfavourable for tsetse flies, and major outbreaks are unlikely. Most of the population is settled in these areas, but in villages within the fly area, where clearings are insufficient to protect the natives, minor epidemics are not unlikely. Isolated cases have occurred in scattered villages and it seems probable that these can only be explained on the assumption that game animals are the reservoir of infection.

Aetiology.

Most workers believe that the trypanosomes of man must have been derived originally from *T. brucei*, but have not been able to demonstrate how this change has been made. HARDING (p. 75) reports an experiment in which an attempt was made to throw light on this question.

* The information from which this series of summaries has been compiled is given in the abstracts made by the Sectional Editors in the *Tropical Diseases Bulletin*, 1941, Vol. 38. References to the abstracts are given under the names of the authors quoted and the pages on which the abstracts are printed.

Working with a strain of *T. brucei* sensitive to human serum, he has found that feeding *G. tachinoides*, containing developing trypanosomes, on human blood fails to produce any increase of resistance to human serum.

HAWKING (p. 633) reports experimental work which shows that *T. rhodesiense* from patients who have relapsed after treatment with tryparsamide have greater resistance to this compound than have those from untreated patients. He thinks that this resistance is acquired (during unsuccessful treatment) rather than natural (originally present and responsible for the relapses) ; and quotes the case of one patient in whose trypanosomes there appeared to be a definite increase in resistance, after a second course of tryparsamide, over that which existed after the first course. He (p. 78) failed to find evidence of abnormal resistance to Bayer 205 in *T. rhodesiense* from patients in a state of relapse after treatment with this drug. He further (p. 306) notes that two strains of *T. rhodesiense*, resistant to human serum when fresh from the human hosts, became sensitive after passage through rats.

VANDERPLANK (p. 632) records experiments which suggest that the transmissibility to the fly, and the virulence of a strain of *T. rhodesiense* in rats, may be enhanced by passing it through animals with low mean body temperature. In a letter subsequently published in the *Trans. Roy. Soc. Trop. Med. & Hyg.*, 1942, Vol. 35, No. 4, p. 239, however, HORNBY points out that the animals used are not homothermic and that their body temperatures vary greatly throughout the hours of a hot day. He therefore questions the soundness of the hypothesis that the modification is a function of the "normal blood temperature" of the host.

Transmission.

JACKSON (p. 307) has studied *G. morsitans* in Tanganyika Territory by capturing, marking, and recapturing flies in a defined area of land. The flies are confined, by vegetational types, to certain ambits from which they rarely stray, and are generally prevented from moving more than half a mile in any one direction. The average life of the male flies is 2–6 weeks throughout the year, but is longest in the rainy season. In the dry season many die of starvation, for at this time many feeds are needed. Females move more extensively than males through the savannah, and probably live longer. In a further communication the same author (p. 632) points out that since females live about twice as long as males the female population is about twice as great as the male. As a result of the relatively slow drift outside the ambits, wandering game animals have very little effect in aiding dispersal of the flies. If seasonal firing of bush is prevented the fly population falls until the middle of the rains. This effect may be due to destruction of pupae by ants. Marked flies do not live as long as unmarked, but the reason for this is not known.

JACK (p. 307) gives details of the behaviour of *G. pallidipes*, *G. brevipalpis* and *G. morsitans* which cannot be further abstracted.

In Kenya TEESDALE (p. 306), by the examination of female *G. palpalis* caught in blocks of riverine bush, has found that the proportion of infertile females is approximately the same in all the areas, there being no evidence that a higher proportion of infertile females is to be found in the more sparsely populated areas. Even when the

population of *G. palpalis* is reduced to a low level there is no indication that males and females find difficulty in meeting, or that the remaining population is likely to die out of its own accord.

ZUMPT (p. 74) discusses the classification of the subspecies of *G. palpalis* and their distribution in the Belgian Congo.

Clinical Findings and Treatment.

SALEUN (p. 304) gives information on the diagnosis of trypanosomiasis of man in French Equatorial Africa. No one method of examination can be relied upon if the result is negative, but the most important are examination of gland juice, triple centrifugation and lumbar puncture. Thick blood films give few positive results and the author considers that examination of bone marrow cannot replace older methods. He gives details of the present condition of patients diagnosed several years ago. In discussing the question of reinfection, the author, while admitting that proof has not been obtained, expresses his opinion that immunity either does not occur, or if it does, is not of long duration in a person recovered from a previous infection.

McLETCHIE (p. 76) reports on the use of 4 : 4′-diamidino stilbene in human trypanosomiasis in Nigeria. In a small series of cases without marked involvement of the nervous system he found it to be apparently as effective as Bayer 205. Patients with mild infections received an average total dose of 8·8 mgm. per kilo. ; those with more advanced disease an average of 6·3 mgm. per kilo. In the latter group reactions to the drug were seen ; these reactions were usually transient. It was found that most patients could stand intravenous injections of 1–1·5 mgm. per kilo., and some 2 mgm. per kilo. Six injections were given within 9 days, and the author remarks on the advantage of this short course, but advises increase to 10 injections [presumably in a correspondingly longer period] for routine treatment. In Gadau, N. Nigeria, however, HARDING (p. 77) found improvement after 4 : 4′-diamidino stilbene only in cases in which the cerebrospinal fluid was not abnormal. In general the disease is of a severe type in this area, and the author found pathological changes in the cerebrospinal fluid in 94 of 100 unselected cases ; most of the patients exhibited nervous symptoms. He concludes, therefore, that although in this area the drug does not appear to offer advantages over antrypol and tryparsamide, it may, in other places where the disease presents a different character, lead to better results.

In the Gambia BOWESMAN (p. 310) has obtained good results with 4 : 4′-diamidino stilbene given intravenously in doses of 1 mgm. per kilo. of body weight twice each week to a total of 7 to 10 injections. He considers that larger doses are not altogether safe, and describes the reactions which may occur after intravenous administration :—headache, sweating, tachycardia, vomiting, weakness of the pulse and fall in blood pressure. There is rapid amelioration of all symptoms and physical signs, but cases in which the protein of the cerebrospinal fluid is above 0·05 per cent. are not suitable for this treatment. The drug does not cause eye symptoms or albuminuria, and has the advantage that treatment can be carried out in half the time necessary for tryparsamide.

FRIEDHEIM (p. 634) reports good results from the use of the disodium salt of 2 : 4-diamino-6-(arsono-anilino)-triazine, known as

triazine arsinic acid (No. 4289). This was tried in cases of sleeping sickness in French West Africa, and the dosage is set out in detail. The only toxic effects were gastrointestinal. Clinical cures were observed in 29 cases re-examined up to 9 months after treatment. Oral treatment is possible and though the effects are slower than after injection, no relapses were observed in a few patients thus treated.

HAWKING (p. 78) found that, in patients who had relapsed after treatment with Bayer 205, the concentration of the drug in the blood was less than that in comparable patients who had not relapsed, and concludes that defective accumulation of the drug was one of the main factors responsible for the relapses.

HAWKING (p. 312) has investigated the trypanocidal activity, against *T. gambiense*, of human blood after injection of tryparsamide. This activity rises to a maximum 24 hours after injection and then diminishes so that after 4 days it is inappreciable. The activity in the blood is rather greater than that in the cerebrospinal fluid. In the cerebrospinal fluid he (p. 313) found trypanocidal action, after injection of tryparsamide, to be greatest between 17 and 65 hours after injection. Lesions of the cerebral membranes due to *T. rhodesiense*, and indicated by increase of cells and protein in the cerebrospinal fluid, do not, apparently, exert any constant influence upon the penetration of tryparsamide into the fluid or on its activation therein, but the degree of trypanocidal activity produced is insufficient to exert much effect upon freshly isolated strains of *T. rhodesiense*. With neocryl and undecane diamidine the trypanocidal activity produced was insignificant.

ACRES (p. 311) has compared neocryl with tryparsamide in the treatment of sleeping sickness in the Belgian Congo. In first stage cases he considers the two drugs to have somewhat similar beneficial effects, in second stage cases neocryl compares very unfavourably with tryparsamide. ROSS (p. 78) gives details of his findings in a comparison of the toxicities of tryparsamide and neocryl when used in the treatment of neurosyphilis. Neocryl is less toxic than tryparsamide, and he states that it is to be preferred in all cases of neurosyphilis in which pentavalent arsenicals are necessary.

Control.

For the control of sleeping sickness in Nyasaland LAMBORN (p. 72) suggests that a system of diagnosis which may overcome the difficulty of concealment of cases should be instituted, in which blood slides are taken by vaccinators and dispensers, of all sick persons and especially of all persons with fever. An indirect attack on the fly might be carried out through measures directed against game animals; this procedure would entail modification of the game laws.

In South Kavirondo, Kenya, TEESDALE (p. 306) reports that by the use of the block method of clearing riverine bush, in which blocks several miles long have been divided by clearings about 1,000 yards wide, the density of fly has been reduced from 100–200 tsetse per fly-boy-day to about 1 per fly-boy-day. This has been effected by hand catching within the blocks, squads of boys having patrolled regularly and having caught enormous numbers.

WALKER (p. 631) states that in Nigeria, where work on a clearing of 680 square miles is far advanced, most of the tributary streams dry up in the dry season, so that barrier clearings are being made to prevent tsetse from spreading back from the larger rivers, which are the permanent foci, during the rains.

Chagas's Disease.

Epidemiology and Reservoir Hosts.

Reports of cases of Chagas's disease have been published from Chile (p. 80), and Minas Geraes (p. 639).

Dias (p. 639) shows how a cat became infected after eating infected rats. There is little doubt that cats and dogs which eat rats and small sylvan mammalia become infected in this way and so become intermediaries from which human infection may occur ; it is possible that they may similarly become infected through eating infected insects. In Chile the known reservoirs of Chagas's disease comprise 22 wild animals and the dog and cat. Gasić Livacić and Bertín (p. 82) give a list of the animals, and note that in some districts the proportion of infected animals is high. Mazza (p. 315) gives a list of animals found infected in Jujuy and Salta, provinces of the Argentine.

Pifano and Dias (p. 639) have found trypanosomes in the blood, and leishmania forms in the heart and stomach of the bat *Carolia perspicillata* in Venezuela. These were capable of infecting a number of Reduviid and other bugs and work is to be done to prove whether the flagellate is *T. cruzi*.

Aetiology and Transmission.

Mazzotti (p. 81) records the results of the inoculation of mice with *T. cruzi*.

Kolodny (p. 81) has shown that in rats kept at a temperature of 40° to 45°F., infection with *T. cruzi* pursues an intense and acute course, with blood stream invasion much heavier than in animals maintained at ordinary room temperature.

Packchanian (p. 637) has grown *T. cruzi* on rabbit blood agar slopes and has used killed and living cultures for injection of rabbits. Agglutinins against the trypanosomes were found in high titre after this immunization, but with the sera of animals infected with other trypanosomes the maximum titre observed was only 1 : 32. Details of technique are given.

Gasić Livacić (p. 82) found infection in Triatomidae of Chile in the following proportions :—adults 40 per cent., nymphs 21·9 per cent. and larvae 19·6 per cent. Packchanian (p. 81) found infection with *T. cruzi* in 65 per cent. of *Triatoma heidemanni* caught in Texas, but none in *T. sanguisuga ambigua* caught in Florida, though the latter is capable of transmitting the infection.

Pathology and Clinical Findings.

Mazza and Miyara (p. 317) found leishmanial forms of *T. cruzi* and characteristic histological changes in an inoculation chagoma removed from a man whose blood was negative to thick drop examination and to the xenodiagnostic method and in whom smears of tissue taken from the lesion were also negative.

Mazza *et al.* (p. 318) describe the characteristic pathological lesion found in inoculation chagomata ; it consists of fat necrosis of the tissue cells, especially of the subcutaneous fat. This is not a secondary change, but is part of the initial inflammatory stage of invasion, and is a manifestation of the colonization of the leishmania forms in the fatty tissue. Secondary tumours may follow the primary inoculation

chagomata and may be widely spread. The authors record one case in which the tumours rapidly disappeared after treatment with Bayer 7602 to a total dosage of 22·2 mgm. per kilo. body weight. The patient was a man of 50.

MAZZA and JÖRG (p. 318) have produced nodules of reticular histiocytes indistinguishable from the lesions of Chagas's disease by the injection of filtered emulsions of the disintegrated bodies of *T. cruzi* taken from culture. The nodules are apparently due to a water-soluble substance which is not dialysable, and it is inferred that it is the destruction of the protozoon in inflammatory foci or in macrophages which gives rise to these nodules in infected animals.

MAZZA and FREIRE (p. 316) describe cases of local inoculation chagomata with secondary haematogenous tumours.

MAZZA and URCELAY (p. 316) describe the cutaneous lesions of Chagas's disease, and describe a case in which an inoculation chagoma was associated with a morbilliform eruption. Treatment with Bayer 7602 was quickly followed by disappearance of the ocular symptoms and fading of the rash. MAZZA *et al.* (p. 317) describe a case of a child in which there were secondary chagomata widely distributed over the body. Improvement followed the administration of Bayer 7602 in doses of 90–120 mgm. per kilo. body weight.

DUSSERT *et al.* (p. 83) describe the Machado complement fixation test for Chagas's disease, for which the antigen is obtained from the spleen of infected puppies. It is valuable in diagnosis of chronic cases, but is rarely positive until 30 days after infection ; it is not absolutely specific, being positive in cases of African trypanosomiasis and leishmaniasis, but tests in normal and syphilitic persons were found to be negative.

MAYER and PIFANO (p. 640) describe the preparation of "cruzin" from *T. cruzi* ; with this they have performed intradermal tests, and have obtained definite positive results in infected persons, attaining a maximum in 48 hours. The test appears to be of great use in diagnosis.

Charles Wilcocks.

MALARIA.

KUMM (Henry W.) & RUIZ (Horacio). Investigación sobre malaria y zancudos en Costa Rica. Informe anual del reconocimiento del paludismo y de mosquitos en el República. [**Investigation of Malaria and Mosquitoes in Costa Rica.**]—Reprinted from *Memoria de Salubridad Pública y Protección Social de 1938.* 32 pp. With 7 maps. 1940. San Jose, Costa Rica : Imprenta Nacional.

This is a concise report which gives a vast amount of information concerning the geographical distribution of malaria and of mosquitoes in Costa Rica. Costa Rica presents a surprising variety of climatic conditions considering its relatively small size, a variety dependent upon differences of altitude. The shortest distance between the Atlantic and Pacific coasts is only 75 miles. Malaria is almost confined to the low-lying coastal plains. The elevated range that forms the backbone of the country is free from malaria save for occasional epidemic outbreaks in certain of the river valleys in the uplands. During a year 8,798 children below 13 years of age were examined at 158

places in nearly all parts of the country. They were mostly school-children but in the province of Limón, where schools are few and far between, children were collected in some convenient building with the help of the police. Most attention was paid to the low-lying provinces in which malaria is most prevalent. The spleen rates of the different provinces, with the number of children examined in each (shown in brackets), were as follows: Alajuela (949) 1·5; Cartago (1,191) 3·9; Guanacaste (3,601) 17·2; Heredia (80) 0·0; Limón (1,550) 11·9; Puntarenas (1,362) 16·5, and San José (65) 3·1.

Blood films from 3,838 children were examined, mostly by the thick drop method, but thin smears were also made. The findings were correlated with the results of the spleen examinations. Of 2,996 children showing no parasites the spleen rate was 15·3; of 180 with *P. vivax* the spleen rate was 77·8; of 213 with *P. falciparum* the spleen rate was 74·2; of 226 with *P. malariae* the spleen rate was 80·5; of 57 with mixed infections the spleen rate was 86·0; of 166 with unidentified parasites the spleen rate was 62·1. *P. malariae* was most common along the Pacific coast.

During the inquiry 88 species of mosquitoes were identified; these are listed. The species of Anopheles found were as follows (the number of places in which found is inscribed against each): *A. albimanus* (87), *A. argyritarsis* (74), *A. tarsimaculatus* (4), *A. strodei* (15), *A. pseudopunctipennis* (60), *A. eiseni* (12), *A. apicimacula* (41), *A. punctimacula* (14), *A. neomaculipalpus* (11), *A. vestitipennis* (3), *A. neivai* (2), and *Chagasia bathanus* (17). All the evidence collected supports the view that *A. albimanus* is by far the most important, if not the only, vector of malaria in Costa Rica.

In all, 19,602 mosquitoes were identified. Anopheles dissected numbered 593, of which 559 were *A. albimanus*. One of this species was infected. *Norman White.*

Kumm (Henry W.), Volio (Enrique) & Ruiz (Horacio). Malaria. Reconocimiento y control realizados en cooperación con el Gobierno de Costa Rica. [**Investigation and Control of Malaria carried out in Cooperation with the Government of Costa Rica.**]—Reprinted from *Memoria de la Secretaria de Salubridad Pública y Protección Social correspondiente al año 1939.* 16 pp. With 8 maps, 10 figs. & 1 chart.

In Costa Rica malaria is almost confined to the low-lying coastal plains. Along the Pacific coast *A. albimanus*, the vector, is most numerous during the rainy season.

The greater part of this report consists of a description of the anti-malaria surface drainage work that has been carried out in Liberia, the capital of the Province of Guanacaste, a small town with a population of 2,574, at a cost of ₡90,700.* The results have proved very satisfactory. The spleen rate fell from 37·5 per cent. in March 1938 to 8·9 in November 1939; in the town of Las Canas near by, where no similar measures were undertaken, the spleen rate was 16·8 per cent. in February 1938 and 20·6 in November 1939. Further drainage schemes for Las Canas and Santa Cruz have now been put in hand.

N. W.

* ₡ represents the Colon, a coin quoted at the rate of 5·62 to the American dollar.

BOYD (Mark F.). **An Historical Sketch of the Prevalence of Malaria in North America.**—*Amer. Jl. Trop. Med.* 1941. Mar. Vol. 21. No. 2. pp. 223–244. With 2 figs. [36 refs.]

LOBO (Martin M.). Arrozales y paludismo. [**Ricefields and Malaria.**] —*Semana Méd.* 1941. Apr. 24. Vol. 48. No. 17. pp. 950–965. [14 refs.]

The author has made a study of the responsibility of rice-cultivation for endemic malaria in the Famailla and Concepcion Departments of the Tucuman Province of the Argentine. He deals at some length with the findings of investigatons in Italy and Spain concerning malaria and rice cultivation, and describes the economic importance of rice-cultivation in the Argentine. In some parts of Europe rice-growing areas are relatively free from malaria in spite of prolific breeding of anophelines, non-vector races of *A. maculipennis*. Nothing comparable is seen in the Tucuman Province. Here land placed under rice-cultivation for the first time and land that has been devoted to rice cultivation for two or more years are alike productive of large numbers of *A. pseudopunctipennis*, the most important, if not the sole, vector. In the Rio Chico and Chicligasta Departments the parasite and spleen indices were very much higher among populations living near rice-fields than among populations living four or more kilometres away.

The species of Anopheles found breeding in rice-fields, irrigation channels and seepages were *A. pseudopunctipennis*, *A. argyritarsis*, *A. albitarsis* and *A. tarsimaculatus*. More than 99 per cent. of the Anopheles caught in human habitations were *A. pseudopunctipennis*.

In conclusion, recommendations are made concerning changes of, and additions to, existing legislation. No rice-cultivation should be allowed within five kilometres of villages with more than 1,000 population or within four kilometres of smaller places. Irrigation should be intermittent, seven days flooding and three days dry. Other recommendations concern the use of Paris green, free medical assistance, prophylactic quinine, mosquito proofing and mosquito nets.

N. W.

ROMAÑA (C.). Observaciones sobre la epidemia de malaria 1939–40 en Resistencia (Chaco) y sus alrededores. [**Observations on the Epidemic of Malaria in Resistencia (Chaco) and its Neighbourhood.**] —*Semana Méd.* 1941. Jan. 30. Vol. 48. No. 5. pp. 257–261. With 2 figs. (1 map).

Resistencia is in the north-east of the Argentine where the provinces of Resistencia, Corrientes and Chaco meet at the south-west corner of Paraguay. The Chaco territory suffered from a severe epidemic of malaria in 1920, a year of exceptionally heavy rainfall, since when, till 1939, both malaria and Anopheles have been very little in evidence. The year 1939 was another year of excessive rainfall; malaria reappeared towards the close of the year and continued throughout most of 1940. The author describes the distribution of some 60 cases. Anophelines were very abundant. Three species were identified, *A. albitarsis*, *A. bachmanni*, and *A. tarsimaculatus*; the two former species predominated. *A. albitarsis* is believed to be a vector.

N. W.

SOARES (Helio de Albuquerque). Malaria perniciosa. Considerações em torno de alguns casos de malaria devidos ao "Plasmodium perniciosum" (Ziemann, 1915). [**Pernicious Malaria. Cases of Malaria ascribed to Infection with** *Plasmodium perniciosum* **(Ziemann), 1915.**]—*Brasil-Medico.* 1941. Mar. 1. Vol. 55. No. 9. pp. 132–135. English summary.

The author describes cases of pernicious malaria seen in his hospital at the Nucleo Colonial São Bento in which the infecting parasite is markedly neurotropic. He considers that the Plasmodium responsible for these cases can be distinguished morphologically, and clinically, from *P. falciparum.* The ring-forms are smaller, with very large intensely staining chromatin masses. Upwards of 50 per cent. of the red cells are commonly invaded and multiple parasites are commonly seen in a single cell. The gametocytes are shorter than the typical crescents of *P. falciparum.* In division forms the number of merozoites is greater than in the case of *P. falciparum.* In short, the author considers *P. perniciosum* (Ziemann), 1915, to be a valid species distinct from *P. falciparum.* It is very resistant to the usual antimalaria drugs. Early recognition of the parasite is very desirable so that an energetic attack can be made on the parasite before pernicious symptoms develop.

N. W.

FERRARI (Antonino). Malaria perniciosa. [**Pernicious Malaria.**]—*Brasil-Medico.* 1941. Mar. 29. Vol. 55. No. 13. p. 229.

Referring to the article by SOARES on pernicious malaria (above) the author describes a fatal case of infection with *P. perniciosum* acquired in Belem in the Guandu valley. A clinical diagnosis of typhoid fever was made; subsequent blood examination showed that almost every red cell contained one or more minute ring forms characteristic of the parasite. *N. W.*

THOMSON (R. C. Muirhead). **Studies on the Behaviour of** *Anopheles minimus.* **Part IV. The Composition of the Water and the Influence of Organic Pollution and Silt.**—*Jl. Malaria Inst. of India.* 1941. June. Vol. 4. No. 1. pp. 63–102. With 2 graphs, 1 text fig. & 7 figs. on 4 plates. [38 refs.]

In this paper the author continues his analysis of the factors which determine the selection of breeding places by *Anopheles minimus* [see this *Bulletin*, 1941, Vol. 38, p. 335]. When the composition of the water in natural breeding places was compared with that in waters from which the species was absent, no constant differences were found in dissolved oxygen, and saline ammonia was practically absent from all the waters studied. But organic matter and the degree of pollution (as measured by the albuminoid ammonia and the Tidy figure—oxygen absorbed from permanganate) were consistently lower in the *minimus* breeding places, being several times greater in rice fields than in the tea garden drains. Gravid females of *minimus*, however, fail to distinguish between water from the normal breeding place and water not ordinarily used; and the difference has no effect on the growth and mortality of the larvae. From this the author concludes that "the discovery of a measureable difference in character between two different types of breeding place cannot be considered of any real

significance until it has been tested by experimental methods." On the other hand, when water is polluted by decaying vegetation, whereas *A. hyrcanus* is *not* repelled, eggs being still laid at the height of pollution, gravid females of *minimus* were proved in laboratory experiments to be extremely sensitive and to avoid even very high dilutions. The larvae, however, will develop normally in water with a degree of pollution over 30 times as great as that avoided by the female. Clearly it is the sensitivity of the female that is the essential factor in control by "herbage packing." The identity of the repellent substance was not discovered.

In regard to silt, which seems in nature to deter *minimus* from breeding, the author shows in field experiments that the female mosquito will lay eggs and the larvae develop normally in very silty water, and this was confirmed in the laboratory. He concludes that the controlling effects usually attributed to silt in rivers are probably due to the simultaneous increase in current velocity.

V. B. Wigglesworth.

SEN (P.). **Aquatic Plants in the Ecology of Anopheline Mosquitoes.**—*Jl. Malaria Inst. of India.* 1941. June. Vol. 4. No. 1. pp. 113–137. With 1 plate & 2 charts. [25 refs.]

The author, working near Calcutta, studies the relation between the presence of twelve common aquatic plants and a dozen species of Anopheles; for the latter he collects larvae, and also measures the emergence of adults with a trap net.

The paper contains a large body of fact, not easily reduced or summarized. As an example one notes that *A. ramsayi* is rare or absent among most plants, but commoner in Pistia, from which an average of 3·6 larvae and 0·9 adults are obtained per observation, figures which give some indication of the mortality in pupal or late larval life. Other species are widely distributed among the plants, and much more abundant: for instance *A. annularis* may be found with each sort of plant except duckweed (Lemna), and in the presence of *Hydrilla verticillata* attains the high density of 14·6 larvae and 3·1 adults per observation. Alternatively, if one looks at the matter from the botanical side one finds that Pistia may be associated with any of the local Anopheles (except one species, locally rare), whereas among Lemna one finds only *A. hyrcanus*, *subpictus* and *vagus*.

The observations are interesting. They should if possible be analysed or supported by experiments. The practical value of the work is that one might use some readily seen plant as an "indicator" of the prevalence of a certain species of mosquito. *P. A. Buxton.*

DE MEILLON (Botha) & PEREIRA (Mário de Carvalho). **Notes on Some Anophelines (Dipt. Culicidae) from Portuguese East Africa.**—Reprinted from *Moçambique-Documentário Trimestral.* 1940. No. 23. pp. 69–83. With 1 plate, 7 figs. & 1 map.

A large part of this paper deals with the *funestus* group of Anopheles in Portuguese East Africa, and it emphasizes the difficulties of their identification. This group comprises *A. funestus*, *A. rivulorum* and its variety *garnhamellus*, and *A. leesoni*. The differentiation of the larvae

of these forms is relatively easy along the lines established by LEESON. But the adult differences are still obscure. The relative importance of these species as malaria carriers was not investigated.

V. B. Wigglesworth.

HURLBUT (Herbert S.) & HEWITT (Redginal). **Sporozoites of** *Plasmodium lophurae*, **an Avian Malaria Parasite, in** *Anopheles quadrimaculatus*.—*Public Health Rep.* 1941. June 27. Vol. 56. No. 26. pp. 1336–1337.

The authors have succeeded in infecting *A. quadrimaculatus* by feeding on ducks infected with *P. lophurae*. Of 29 fed, 7 were positive for oöcysts and one for sporozoites, but transmission has not yet been proved. The importance to human malaria is that oöcyst and sporozoite indices in *A. quadrimaculatus* are studied, and it appears, therefore, that some method of distinguishing between human and avian infections of this mosquito [and perhaps others] should be attempted.

C. W.

HURLBUT (Herbert S.) **First Instar Characters for distinguishing the Common Inland Species of Anophelines of Eastern United States.**—*Amer. Jl. Hyg.* 1941. July. Vol. 34. No. 1. Sect. C. pp. 47–48. With 9 figs. on 1 plate.

VARGAS (L.). **New Variety of** *Anopheles pseudopunctipennis* **(Diptera, Culicidae).**—*Bull. Brooklyn Ent. Soc.* Brooklyn, N.Y. 1941. Apr. Vol. 36. No. 2. pp. 73–74.

——. *Anopheles pseudopunctipennis willardi*, **n. var. (Dipt. Culicidae).**—*Rev. Soc. Mex. Hist. Nat.* Mexico, D.F. 1941. June. Vol. 2. No. 1. pp. 47–49. [In Spanish.] [Summarized in *Rev. Applied Entom.* Ser. B. 1941. Nov. Vol. 29. Pt. 11. pp. 172–173.]

"In the first paper, it is stated that the extensive distribution of *Anopheles pseudopunctipennis*, Theo., which occurs sporadically from the western United States to northern Argentina, and the fact that it is considered a dangerous vector of malaria in some regions but not in others led to the theory that it might include varieties differing in ability to transmit the disease. From a study of the morphology of the eggs, the author distinguishes four varieties. In addition to the typical one, these are *boydi*, Vargas, *franciscanus*, McCracken, and *willardi*, var. n. Characters distinguishing the eggs of the four varieties and the larva and adults of both sexes of var. *willardi* are briefly described. It was found to occur over an area of about 60 sq. miles in the State of Chihuahua, Mexico, and was the only *Anopheles* taken in July and August 1940. The adults of both sexes enter houses and stables, and the larvae are found in sunlit pools and streams.

"The second paper contains substantially the same information, but the notes on the distribution of *A. pseudopunctipennis* and the larval characters of the new variety are somewhat more detailed, and the morphological characters of the eggs of the four varieties are shown in a table."

VARGAS (Luis). Nota sobre los huevecillos de Anopheles mexicanos. [**The Eggs of Mexican Anophelines.**]—Reprinted from *Gac. Med. de Mexico.* 1941. pp. 107–123. With 12 figs. [17 refs.] English summary.

" The proper identification of malaria vectors is indispensable in the epidemiological studies of the disease, and the eggs in some circumstances allow the distinction not only of species but also of varieties.

" The author details the manner by which the eggs were obtained, the nomenclature of the structures and gives the key for the species. He discusses also the evolution lines of *pseudopunctipennis, strodei, triannulatus, albitarsis, darlingi* and *oswaldoi.*"

KUMM (Henry W.). **The Eggs of Some Costa Rican Anophelines.**—*Amer. Jl. Trop. Med.* 1941. Jan. Vol. 21. No. 1. pp. 91–102. With 4 plates. [14 refs.]

" The eggs of nine of the commoner Costa Rican anophelines were studied. Four had been known previously from reports published from other countries. The remaining five species, the eggs of which are here described for the first time, include *Anopheles anomalophyllus, A. apicimacula, A. neomaculipalpus, A. punctimacula* and *A. vestitipennis.* About thirty photomicrographs were taken of dorsal, lateral and ventral views of ova and nearly fourteen hundred eggs were measured. The longest eggs were those of *A. neomaculipalpus* and *A. vestitipennis,* the shortest those of *A. strodei.* There was no evidence that the eggs of *A. albimanus* laid at the beginning of the dry season were any larger than those deposited during the preceding rainy months. Variations were found in the ova secured from *A. punctimacula* and *A. vestitipennis.* Such variations occurred at times in a batch of eggs laid by a single female mosquito. The real significance of the different types of eggs laid by apparently identical female anophelines is not yet clear, though it is possible that these variations may be seasonal like the *A. walkeri* observed by Hurlbut."

KUMM (Henry W.) & RAM (L. M.) **Observations on the Anopheles of British Honduras.**—*Amer. Jl. Trop. Med.* 1941. July. Vol. 21 No. 4. pp. 559–566. With 1 map.

The paper deals with the Anopheles of British Honduras and the relation of the species to the transmission of malaria.

It will be remembered that *Anopheles darlingi* has been recognized for some years as an important carrier of malaria in parts of Brazil, Guiana and Venezuela. Until 1940 it was supposed that its distribution was limited to that well-defined area, but in that year it was discovered several hundred miles away in British Honduras. In British Honduras the authors find that *A. darlingi* occurs in rural areas, but not immediately on the sea coast. It frequents houses and is evidently a vector of malaria ; among 114 dissected, sporozoites were found in the salivary glands of one. It is also reported that *A. vestitipennis* transmits the infection. In all, nine species of anophelines were found in British Honduras, of which *A. albimanus* is the most abundant and widely distributed. *P. A. Buxton.*

RAMOS (A. da Silva) & UNTI (Ovidio). Notas sobre os anofelinos de São Vicente e suas imediações. [**The Anophelines of S. Vicente.**]—*Ann. Paulist. Med. e Cirurg.* 1941. Apr. Vol. 41. No. 4. pp. 305–6, 309–14. With 1 fig. English summary.

"The authors report the data they obtained on the *Anopheles* from S. Vicente (Est. S. Paulo-Brasil) and its environments, an endemic malarial region.

"They refer to the chemical conditions of the breeding places where the *p*H of the water was 6·0 to 6·4 and 7·2 to 7·4, and also to the eggs of *A. oswaldoi* var. *oswaldoi*, *A. intermedius*, and *A. mediopunctatus*."

SARKAR (S. K.). **Two Fatal Cases of Cardiac Malaria.**—*Indian Med. Gaz.* 1941. Feb. Vol. 76. No. 2. p. 93.

The author describes two fatal cases of *P. falciparum* malaria, one of a young man aged 16, the other of a woman aged 60. Both of these patients developed symptoms of acute cardiac failure quite early in acute attacks of malaria and both died within a few hours of the onset of cardiac symptoms. In neither case was there any evidence of organic heart disease before the attack of malaria. *N. W.*

CHATTERJEE (P. K.). **A Case of 'Raynaud's Phenomenon.'**—*Calcutta Med. Jl.* 1941. Apr. Vol. 38. No. 4. pp. 187–190. With 2 figs. on 1 plate.

A Hindu female, aged 16, suffered from symmetrical cyanosis of fingers and toes. The patient came from an endemic malarial area. Five months previously she had been very ill and had passed black coloured urine; a diagnosis of blackwater fever had been made. Gangrene involved all the finger tips. After three weeks in hospital the cyanosis disappeared. The author discusses Raynaud's disease and the various conditions in which Raynaud's phenomenon, symmetrical peripheral cyanosis with, or without, gangrene, may occur. He considers that chronic malaria and blackwater fever were important predisposing causes in the case he reports. *N. W.*

JOURNAL OF THE ASSOCIATION OF MEDICAL WOMEN IN INDIA. 1941. May. Vol. 29. No. 2. pp. 92, 94–97.—**Two Cases of Cerebral Malaria associated with Pregnancy.**

A woman, eight months pregnant, was admitted to hospital suffering from vomiting and oedema of the legs. There was no albuminuria. She left hospital after four days' stay and was readmitted two days later, unconscious; she had had seven fits on the morning of her readmission. Her urine then contained albumen. She died the following day. A partial post-mortem examination was made. The liver showed none of the changes usually seen in eclampsia. There was a large amount of malarial pigment in the tissues of the placenta, and ring forms of Plasmodia were seen in the red cells in the maternal sinuses of the placenta. Most of the speakers at the clinical meeting to which the case was reported appeared to think that death was caused by cerebral malaria.

The second case was that of a woman in the 8th month of pregnancy who was admitted to hospital in a low dazed condition; there was no

fever. After a short period of violent delirium she died. Post-mortem examination showed large numbers of malaria parasites in the capillaries of the brain. Examination of the liver excluded eclampsia as a cause of death. *N. W.*

KITAGAWA (M.) & VAZQUEZ-COLET (Ana). **Observations on the Protein Tyrosin Reaction as a Diagnostic Test for Malaria.**—*Acta Med. Philippina.* 1941. Jan.–Mar. Vol. 2. No. 3. pp. 355–365.

Using the method devised by PROSKE and WATSON [see this *Bulletin*, 1939, Vol. 36, p. 813] the authors applied the protein-tyrosin serodiagnostic test to the sera of 1,872 individuals, of whom 1,491 were normal individuals, 239 were non-malarious patients whose sera gave positive syphilis reactions, and 142 were suffering from malaria. The tyrosin index for euglobulin was below 80 in 99 per cent. of normal cases, and below 45 in 83 per cent. In sera from malaria patients the tyrosin index ranged from 50 to 240; it was indicative of malaria (above 85) in 94·5 per cent. of known malaria cases. Only 20 per cent. of syphilitic malaria-free sera gave tyrosin indices higher than 80. *P. vivax* infections gave the highest reactions. Chronic malaria cases gave higher tyrosin indices than acute cases. *N. W.*

SO (Kinza). Zum Klinischen Studium der Leberfunction mit Azorubin-S-Methode. III. Mitt: Ueber die Störung der Leberfunktion bei Malaria. [**Liver Damage in Malaria.**]—*Taiwan Igakkai Zassi* (*Jl. Med. Assoc. Formosa*). 1941. Apr. Vol. 40. No. 4. [In Japanese pp. 730–747. With 2 figs. [22 refs.] German summary pp. 747–748.]

The author estimates liver damage by the Azorubin-S test, in which 2 cc. of a 1 per cent. solution of the dye are injected intravenously, and thereafter the amount in the urine is estimated colorimetrically at various intervals. In malaria the excretion is increased over the normal and is parallel with the increase in urobilin in the urine. This is taken as an indication of liver damage, and is especially marked in the febrile period of the disease and is more marked in subtertian than in benign tertian infections. There is no correlation between this test and the Takata reaction. Figures of the cases investigated are given. *C. W.*

RIN (Senshu). Ueber Urobilin- und Indicanausscheidung in Harn bei Malaria. [**The Urinary Excretion of Urobilin and Indican in Malaria.**]—*Taiwan Igakkai Zassi* (*Jl. Med. Assoc. Formosa*). 1941. Apr. Vol. 40. No. 4. [In Japanese pp. 777–782. German summary pp. 782–783.]

In acute malaria urobilin or urobilinogen was found in the urine in 60 to 74·1 per cent. of cases, in chronic malaria in 12 to 58 per cent., being more common in subtertian than in benign tertian cases. Indican, however, is found more frequently in latent or chronic cases (35·2 to 41·1 per cent.) than in acute (14·7 to 36·9 per cent.), but shows a distinct correlation with malaria. *C. W.*

So (Kinza). Ueber die Nierenstörungen bei Malaria. [**Renal Damage in Malaria.**]—*Taiwan Igakkai Zassi* (*Jl. Med. Assoc. Formosa*). 1941. June. Vol. 40. No. 6. [In Japanese pp. 1040–1047. [27 refs.] German summary pp. 1047–1048.]

The author has found albuminuria in acute subtertian malaria in 64·9 per cent. of cases during febrile periods and in 63·2 per cent. during intervals; in acute benign tertian 41·2 and 12·5 per cent. respectively, and in chronic cases in 30·2 per cent. In addition 3 cases of acute nephritis were found in 97 cases. The concentration power of the kidney was intact and the phenol sulphonephthalein test normal. Excretion of salt was generally increased in the febrile period and decreased during the fever-free period. [See also this *Bulletin*, 1930, Vol. 27, pp. 508, 651; 1931, Vol. 28, pp. 131, 998; 1933, Vol. 30, pp. 75, 97, 499; 1934, Vol. 31, p. 426, for the special association of nephritis with *quartan* malaria.] *C. W.*

Oesterlin (Manfred). Blutzuckerspiegel und Malaria. Eine chemotherapeutische Studie. [**Blood Sugar and Malaria: a Chemotherapeutic Study.**]—*Arquivos do Inst. Biol.* São Paulo. 1940. Vol. 11. pp. 333–337. [17 refs.]

This is a review of the work of many authors on the effect of a number of chemicals (synthalin and allied substances, diguanidine, undecane diamidine and others) on animal trypanosomiasis and on bird malaria. Though some of these drugs have the effect of reducing the blood sugar, the author concludes that their beneficial actions in trypanosomiasis and malaria are not due to this, but are the result of direct effect on the parasites. [There is nothing new in this conclusion.] *C. W.*

Rao (V. Venkat). **The Effect of stocking Rice Fields with Sullage at Khurda Road on Anopheline Breeding.**—*Indian Med. Gaz.* 1941. Feb. Vol. 76. No. 2. pp. 86–88.

In the vicinity of the Khurda Road railway colony in Orissa, rice-fields are almost the only breeding places of the local anopheline vectors. The sullage from this community of about 3,500 persons passes through a kutcha drain, through numerous rice-fields, to the Daya River. One rice-field near the outfall was selected for experiment, a similar field serving as control. Once a week in the dry season from March to June sullage was allowed to flow into the experimental field till it reached a depth of about half an inch. Usually the field became dry in 24 to 36 hours, and thus prevented the breeding of *C. fatigans*. The field was ploughed, when dry, about once a month during this period. At the beginning of the rains rice seed was broadcast; rice is not transplanted in this part of Orissa. Thereafter the field was never dry till harvesting, the depth of water varying from one to three inches. The crop is entirely dependent on rain water. From July 1st to December 31st larval sampling was done once a week in the treated and in the control fields. The total numbers of Anopheles larvae collected during this period were:—in the sullage-treated field *A. subpictus* 275, *A. vagus* 176, *A. culicifacies* 1, and *A. annularis* 2; in the control field *A. barbirostris* 21, *A. hyrcanus* 117, *A. subpictus* 175, *A. vagus* 83, *A. culicifacies* 27, *A. annularis* 139, *A. aconitus* 70, and *A. varuna* 7. *A. annularis* is the chief vector in the Orissa coastal

plain. Thus it would seem from this first experiment that the treating of a rice-field with sullage greatly decreased the breeding of vector species while it increased the breeding of less harmful species. *N. W.*

RUSSELL (Paul F.), MULLIGAN (H. W.) & MOHAN (Badri Nath). **Specific Agglutinogenic Properties of Inactivated Sporozoites of** *P. gallinaceum.*—*Jl. Malaria Inst. of India.* 1941. June. Vol. 4. No. 1. pp. 15–24.

The authors have shown that the sporozoites of *Plasmodium gallinaceum*, dissected from the salivary glands of experimentally infected mosquitoes (*Aëdes albopictus*, *Armigeres obturbans*, *Armigeres kuchingensis*), may be completely inactivated by exposure in saline solution to ultra-violet radiations. Such inactivated sporozoites, though incapable of producing infections when injected into fowls will, however, stimulate the production of agglutinins. The serum of such fowls will agglutinate sporozoites freshly dissected from infected salivary glands. In no case after repeated injections of sporozoites was the agglutination titre of the serum less than 1/4,096, while in one case it was 1/262,144. These titres are considerably higher than those given by the sera of fowls which have recovered from acute infections. *C. M. Wenyon.*

MULLIGAN (H. W.), RUSSELL (Paul F.) & MOHAN (Badri Nath). **Active Immunization of Fowls against** *Plasmodium gallinaceum* **by Injections of Killed Homologous Sporozoites.**—*Jl. Malaria Inst. of India.* 1941. June. Vol. 4. No. 1. pp. 25–34. [29 refs.]

The authors review the various attempts which have been made by other workers to produce active immunity to malarial infections in monkeys and birds by different vaccination procedures. They then discuss their own attempts to vaccinate fowls against *Plasmodium gallinaceum* infections. As a vaccine the inactivated sporozoites mentioned in the paper reviewed above were employed. It was there shown that repeated injections of such sporozoites caused the appearance in the blood of specific agglutinins. The present paper describes the testing of the susceptibility of these fowls to mosquito transmission of the parasite. It was found that in all cases infections occurred as readily as in unvaccinated fowls but that the pathogenic effect of these infections varied with the agglutination titre of the serum. If the titre was 1/16,000 or less the pathogenic effect was the same as in normal fowls and was associated with a mortality of 50 per cent., whereas with a titre of 1/32,000 or more the infections were very mild with no mortality whatever. *C. M. W.*

PLAGUE.

BOMBAY: ANNUAL REPORT OF THE HAFFKINE INSTITUTE FOR 1939 [SOKHEY (S. S.), Director]. pp. 3–6, 33–43.—[**Studies on Plague.**]

In the general review of the work of the Haffkine Institute reference is made as usual to the large quantities of plague prophylactic vaccine, 2,887,527 cc., produced during the year. Much work has been done on

the optimum conditions of yield of this vaccine and also on its antigenic characters. At the same time it is evident that intensive researches are being carried out on the chemotherapy of plague which "beget the hope that an effective remedy for bubonic plague is within sight." Field trials, in human cases, of antiplague serum, sulphapyridine and sulphathiazole have already been made. It is contended that a truer picture of the results is given when only those cases are taken into account in which septicaemia was present at the time the treatment was started. Case mortalities, although reckoned on a very small number of cases, were: for antiplague serum, sulphapyridine, sulphathiazole and ordinary iodine treatment 60·6, 43·3, 41·8 and 95 per cent. respectively. Here both sulphathiazole and sulphapyridine have much the same curative effect. In mouse infections, however, sulphathiazole proved by far the more effective and saved 80 per cent. as against 10 per cent. In the human trials the dosage is considered to have been inadequate, although still remarkable. There is little doubt that sulphonamide drugs, administered by the mouth, have the advantage over serum of being comparatively cheap and of not deteriorating with storage.

In Part II of the report research work is taken up in greater detail:—

I. *Plague vaccine.*—Optimal temperatures for the growth of *P. pestis* in broth are 27° to 29°C., while growth at 38°C. is very poor. Much work is being done to differentiate between broth- and agar-grown vaccines and indicates that "only the clear fluid of broth vaccines grown at 27°C. or the clear fluid from suspensions of agar growths incubated at 37°C. should be used."

II. *Field trial of antiplague serum.*—This refers to the comparison of serum with sulphonamide compounds.

III. *Chemotherapy of plague.*—A study was made of six out of 35 synthesized compounds, "particularly heterocyclic derivatives of sulphanilamide." Trials of sulphapyridine and sulphathiazole made on infection in mice proved that sulphathiazole was "possessed of remarkable curative action."

IV. *Epidemiology of plague.*—From 1931 to 1936 a steady reduction in the susceptibility of Bombay rats has been noticed as may be seen from the numbers found plague infected—748, 600, 393, 34, 0, and 0 respectively out of a total of 200,000 to 300,000 animals examined yearly. The susceptibility is on the increase again. This can be measured by the use of the standard infective dose in batches of rats. Percentage mortality had declined from 9·3 to 0 between 1931 and 1936.

V. *Serological strains of P. pestis.*—No serological differences were found between even the virulent and avirulent forms of *P. pestis* although the type of agglutination differed according as the organism was grown at 27°C. or 37°C.

VI. *A serological test diagnostic of plague in rodents.*—The test was one of agglutination of organisms contained in suspensions of either liver or spleen of rodents dead of plague. This test was efficient even if the organs had become putrid, and is likely to be useful. "The serum to be utilised for the test must be one prepared against a 37°C. growth of *P. pestis* and agglutination controls to be set up at the same time are: (1) normal saline, (2) normal rat spleen suspension, (3) normal rabbit serum, and (4) 1–4 dilution of 5-week broth culture at 37°C."

VII. *Study of virulent and avirulent strains.*—In these investigations "confined to the strains 120/5 H virulent and avirulent," various points in the morphology of colonies, morphology of organisms, type of growth, stability in broth and presence of a soluble substance were studied. "The soluble substance contents of the strains seemed to show some correlation with their antigenic values."

VIII. *The metabolism of the plague bacillus.*—"Three aminoacids—proline, phenylalanine and cystine—are necessary for growth in a chemically defined medium" while "more complex growth factors such as thiamin, nicotinic acid, etc., are not indispensable. These latter factors seemed to have a stimulatory effect on the growth of the organism."

IX. *Effects of temperature and humidity on the growth of early stages of the three Indian rat fleas.*—The fleas were *Xenopsylla cheopis, X. astia* and *X. brasiliensis.* It was found that "the effective range of humidity for larvae varies according to temperature and this range is wider at 27°C. and gradually narrows down" with departure from this temperature. Excessive moisture is not itself inimical to the growth of either larvae or pupae, but acts by forming a crust on the surface of the soil impermeable to air. Larvae and pupae die of suffocation. *W. F. Harvey.*

GALE (G. W.). **An Outbreak of Pneumonic Plague in the Kalahari.**—*South African Med. Jl.* 1941. Oct. 11. Vol. 15. No. 19. pp. 369–373.

Mixed bubonic and pneumonic outbreaks have occurred in South Africa since the first recorded case of plague in 1899. The incidence of the pneumonic form has been fairly high and in the present epidemic, involving 37 persons, all cases except one were pneumonic. The single case of bubonic type was one of infection contracted from a pneumonic case. All but one of the 37 persons died and the only escape was the last of the series. All the victins were natives "living in or adjacent to the Morokwen Reserve in the Kalahari, 100 miles north west of Vryburg." One or two points of interest are illustrated by this small epidemic: (1) the intimation of the suspected nature of the outbreak by the police, (2) the transmission of infection from village to village through the medium of persons visiting the sick and thus contracting the disease, (3) the paucity of cases of infection in spite of close contacts, (4) the inability of the native, whose belief in magic is profound, to understand the simplest explanation of plague infection, (5) the cooperative spirit of the native with the health authorities in spite of his ignorance, and (6) the short duration of the outbreak.

Vaccination was adopted as a control measure, in single doses of 1,000 million organisms. It was willingly accepted by the native as a "purely magical procedure." In any case "the great majority of the 1,000 persons vaccinated at Morokwen were never exposed to any real risk," but the vaccination "did much to allay the tendency to panic."

The origin of the outbreak is somewhat doubtful but it is thought to have been due to either the springhare (*Pedetes caffer*) or the multimammate mouse (*Mastomys coucha*). *W. F. H.*

CREEL (R. H.). **Plague Situation in the Western United States.**—*Amer. Jl. Public Health.* 1941. Nov. Vol. 31. No. 11. pp. 1155–1162. With 3 maps.

Many publications have appeared in recent years describing the entry and spread of plague in America. The present account by the Medical Director in charge, U.S. Public Health Service, San Francisco, is a trenchant criticism of the lack of energy and of the apathy which has led to the spread of plague in forty years throughout ten western States. California has been the only exception. Otherwise none of the 10 western States has made any serious attempt to eradicate plague infection in wild rodents. Such efforts as were made might have succeeded in California in the complete extermination of plague had they been reasonably continuous. An undue optimism over the results obtained led to curtailment of funds, and reinfection of rodents, especially of ground squirrels, made fresh appearances. This extension of plague through the ground squirrel population has been slow, taking for example "25 years travelling from the Bay Area to Kern and Modoc counties."

Most interesting are the recommendations and warnings made to meet the present situation: (1) Plague infection in the western States can be exterminated in five years at an expenditure of 2,500,000 dollars. (2) Plague unless controlled may be expected to extend into any city which possesses a sufficiently large rat population. (3) Laboratory examination of rodents is essential and must be continuous. "Negative findings over a period of two years or seasons, provided that an adequate supply of rodents . . . has been examined . . . should be an acceptable standard of eradication." (4) The main reservoir of plague is probably in ground squirrels and it should not be necessary to conduct a campaign of extermination against all wild rodents. Eradication amongst squirrels will be followed by spontaneous disappearance "in such species as the chipmunk, the marmot, wood rat, prairie dog and other groups which do not have the density of population essential for the maintenance of an enzootic reservoir." (5) There is reason to believe that the infection will spread to the rodents of the Great Plains and into the Mississippi Valley and Eastern United States.

W. F. H.

PUBLIC HEALTH REPORTS. 1941. July 25. Vol. 56. No. 30. pp. 1520–1521.—**Plague Infection in North Dakota and Canada.**

In this note it is pointed out that in N. Dakota plague has been found for the first time in fleas from ground squirrels. This is believed to be the furthest east sylvatic plague has been reported in the United States. In New Mexico plague has been found, for the first time, in a kangaroo rat. In south-east Alberta there is an area covering 144 square miles in which plague infection of rodents and their fleas has been demonstrated. Further investigations are in progress. *C. W.*

MOLL (Arístides A.) & O'LEARY (Shirley Baughman). **Plague in the Americas: an Historical and Quasi-Epidemiological Survey.**—*Bol. Oficina Sanitaria Panamericana.* 1941. Mar., Apr., July & Nov. Vol. 20. Nos. 3, 4, 7 & 11. pp. 254–262; 365–374; 697–714; 1149–1155. With 3 maps & 2 graphs. [Refs. in footnotes.]

VI. *Ecuador.*—The last of the Pacific coast countries to be invaded by plague was Ecuador. At the present time plague has apparently

been eradicated from ports and lowland towns but persists in some mountain areas. It was in 1908 that a rat epizootic broke out in Guayaquil and the prediction that human cases would certainly follow was fulfilled. Plague persisted in Guayaquil until 1930 when it disappeared after an energetic anti-rat campaign. The disease spread along the Guayaquil railroad and from its stations to other parts of the country. In most of the railroad towns plague developed as a rat epizootic followed by human plague. *X. cheopis* is taken to have been the vector flea concerned. While this was so for railroad towns the disease appeared elsewhere " to have little connection with either rats or *cheopis*." In mountainous regions especially where the natives live under poor hygienic conditions, use the same garments night and day and sleep on the floor, it is the guineapig (*cui*, *cobayo*) which is incriminated as causing human plague. Epizootics in guineapigs may precede epidemics without any indication of rat mortality or even in the absence of rats altogether. One specially interesting observation was " of great mortality among monkeys (monos) from time to time in the Alamor area preceded by gland swellings in the dead monkeys."

Indians in Ecuador raise guineapigs for food, keep them in their own habitations, eat animals found dead, crowd together at wakes and kill vermin (lice and fleas) with the teeth. Such customs have a definite importance in plague epidemiology and the last mentioned is " believed to be the cause of the tonsillar form of plague." Epizootics of plague were found among wild rabbits in Chimborazo. Although *cheopis* appears to be acknowledged as the chief plague flea it is believed that *P. irritans*, the human flea, is the chief transmitting factor in those localities in which no *cheopis* is found.

" Despite the complete lack of hygiene, the living in close contact with all kinds of animals (pigs, guineapigs, rabbits), the heavy infestation with lice and fleas and the crowding together on occasion . . . the plague morbidity, both pneumonic and bubonic, has been low in the Ecuadorian mountains and the disease is really more endemic than epidemic."

VII. *Peru.*—While Ecuador was the last country of the West coast of South America to be attacked by plague, Peru was the first. None of the coastal departments of Peru has escaped the infection. The disease appeared in 1903 and attacked Pisco and Callao at almost the same time. It is not certain how plague was brought to Peru. The persistence of plague has been due chiefly to the rat, and ESKEY has said " there is no doubt that the extent of the rat infestation of buildings has determined the morbidity of plague in the different communities from North to South in Peru regardless of differences in climatic conditions." " An important focus of Peruvian plague has been the *hacienda*, an agricultural community or small village of from 50 to 200 persons." No sylvatic plague has been reported and most of the human plague has been bubonic; less than 3 per cent. has been pneumonic. With the adoption of active antiplague measures in 1930 the incidence of plague dropped greatly.

VIII. *Paraguay.*—" Paraguay was the first of the American countries in which the presence of bubonic plague was reported." Plague was brought to America in the Argentine coasting steamer *Centauro* in April 1899, although it is possible that the steamer may have left infection in ports of the Argentine before reaching Asuncion. The whole story of the first arrival of plague is a little complicated.

Considerable reluctance was shown by the populace to admit the existence of plague, as was the case elsewhere also. The first epidemic was the severest, and some 15 outbreaks of limited character have occurred since 1900. The last of these to be recorded was one of 9 cases in 1928. "Paraguay has adopted the antiplague measures recommended in an International Sanitary Convention entered into with neighbouring Republics in 1904 and those of the Pan American Sanitary Code." *W. F. H.*

[For earlier reports in this series see this *Bulletin*, 1941, Vol. 38, pp. 321, 625.]

LOBO (Martin M.) & SILVETTI (Luis M.). Peste rural. Brote epidemo-epizoótico del año 1940 en la provincia de Tucumán. [**Rural Plague. Epidemic and Epizootic of 1940 in the Province of Tucumán.**]—*Semana Méd.* 1941. July 31. Vol. 48. No. 31. pp. 262–276. With 1 map & 6 figs.

Tucumán, a province of the Argentine Republic, suffered from a major outbreak of plague in 1940. It was both epidemic and epizootic and affected a large extent of plains territory, stopping only at the foothills of the mountain region. Another feature of the outbreak was its long duration from April to the end of the year. Thirty-six cases of human plague, 24 bacteriologically confirmed, were recorded, of which 23 were fatal. This, however, was not a true total, for the inhabitants, in order to avoid sanitary intervention, concealed cases of plague. There seems to be no doubt that human infection was of sylvatic rodent origin and occurred even in the absence of rats. These infections took place far from urban centres and in places distant from one another. The epizootic, however, was widespread and undoubtedly sylvatic. Positively infected rodents were cuis, Graomys, *R. alexandrinus*, vizcachas (Peruvian hares, *Lagostomus maximus*) and possibly weasels. Isolation of the plague bacillus could be always made by culture or by guineapig inoculation with bone marrow obtained in human beings from the second or third phalanx of a finger. Although the organisms were present in pure culture, direct smear from the bone marrow was not a certain method of diagnosis, for the bacilli were sparse. The fleas identified were *Xenopsylla cheopis* on *Rattus alexandrinus*, *Craneopsylla wolffhügeli* and *Rhopalopsyllus byturus* on *Graomys griseoflavus* and on *Microcavia australis*. Serotherapy was the treatment favoured by the authors but they had small opinion of vaccine or serum prophylaxis. The doses of serum used in treatment were 100 cc. daily in adults as long as required, and up to 50 cc. in children. *W. F. H.*

DE LA BARRERA (J. M.). El último brote de peste selvática en Mendoza (1941). [**The Last Epidemic of Sylvatic Plague in Mendoza.**]—*Rev. Inst. Bacteriológ.* Buenos Aires. 1941. Dec. Vol. 10. No. 3. pp. 390–393. With 3 figs on 2 plates.

The infection was of purely sylvatic origin without the intervention of the domestic rat. Three human cases of plague occurred at places distant from one another in the short period, 3rd to 13th July 1941, in a district which had previously been visited by plague in 1937 and 1939. In all three cases the previous history had been of skinning a hare and the development of an axillary bubo some days later. These

hares are hunted with difficulty and when, as in these three cases, they were hunted with dogs it is only the very young or sick hares which are caught. The three cases of human plague had been preceded by an epizootic among field rodents and abundant evidence was still forthcoming to establish the bacteriological diagnosis of plague. All these facts combined serve to prove that the human cases were due to hares infected with plague. *W. F. H.*

MACCHIAVELLO (Atilio). **Some Special Epidemiological and Clinical Features of Plague in Northeastern Brazil.**—*Public Health Rep.* 1941. Aug. 15. Vol. 56. No. 33. pp. 1657–1661.

[Already abstracted from the Spanish text, of which this article is a summary. See this *Bulletin*, 1941, Vol. 38, p. 624.] *W. F. H.*

BUXTON (P. A.). **The Recorded Distribution of Certain Fleas.**—*Bull. Entom. Res.* 1941. Aug. Vol. 32. Pt. 2. pp. 119–122. With 5 figs.

The world distribution of *Xenopsylla cheopis*, *X. astia*, *X. brasiliensis*, *Nosopsyllus fasciatus* and *Pulex irritans* is set out in 5 maps, with some explanatory matter relating to the selection of data from the literature. *C. W.*

HOLLAND (G. P.). **A Survey of the Rat Fleas of the Southern British Columbia Coast with Relation to Plague Studies.**—*Proc. Ent. Soc. B. C.* Vernon, B.C. 1941. No. 37. pp. 1–5. [Summarized in *Rev. Applied Entom.* Ser. B. 1941. Oct. Vol. 29. Pt. 10. p. 158.]

"A survey of the fleas on rats and mice in the cities of Vancouver and New Westminster, British Columbia, was made between 28th August and 27th November 1939. The records for Vancouver are divided into those from garbage dumps and those from the waterfront, but as differences in infestations in the different areas of New Westminster were slight, only total results are given. *Mus* (*Rattus*) *norvegicus* represented 94·4 per cent. of the rodents taken. At the city dump at Vancouver, 725 rats of this species were taken, and they were harbouring 1,403 fleas, comprising 1,021 examples of *Xenopsylla cheopis*, Roths., 358 of *Ceratophyllus* (*Nosopsyllus*) *fasciatus*, Bosc, and 24 of the genus *Ctenocephalides*; at the waterfront areas the corresponding figures were 316, 615, 2, 611, and 2. At another dump, 115 rats of this species were virtually free from fleas, only 7 individuals of *Ceratophyllus fasciatus* being found on them. At New Westminster, 66 were harbouring 52 fleas, 16 *X. cheopis* and 36 *C. fasciatus*. In addition, 7 individuals of *M.* (*R.*) *rattus alexandrinus*, 1 of *M.* (*R.*) *r. rattus* and 68 mice (*Mus musculus*) were taken in Vancouver and yielded, respectively, 7, 1 and 3 fleas, all of which were *C. fasciatus*. The sex ratios in the flea populations studied are shown in a table. It is pointed out that as most of the rats were trapped, the figures given here are conservative ones. Two groups of rats that were shot had *cheopis* indices of 2·17 and 3·42, respectively.

"The rodents were carefully examined for lesions of the liver or spleen or enlarged lymph glands that might indicate the presence of

plague, and almost all fleas were kept for inoculation tests. Plague has not yet been found in British Columbia, but the large and apparently increasing rat population and abundant fleas constitute an important potential reservoir, particularly in view of the high *cheopis* index in some areas."

RUNNER (A. G.). **Occurrence of the Oriental Rat Flea in Columbus, Ohio.**—*Science.* 1941. Jan. 31. Vol. 93. No. 2405. pp. 111–112.

Xenopsylla cheopis was originally only to be found in seaports of the United States, but it is now known to occur in the interior and has been reported as permanently established at Ames, Iowa. The author now records the finding of 51 specimens on 18 rats caught in the residential section of Columbus, Ohio; no other species was seen. The flea, therefore, appears to be established there. [See also this *Bulletin*, 1941, Vol. 38, p. 623.] *C. W.*

WHEELER (C. M.), DOUGLAS (J. R.) & EVANS (F. C.). **The Rôle of the Burrowing Owl and the Sticktight Flea in the Spread of Plague.**—*Science.* 1941. Dec. 12. Vol. 94. No. 2450. pp. 560–561.

Plague was found in ground squirrels (*Citellus beecheyi*) in California, and the flea *Echidnophaga gallinacea* is a parasite of these rodents. It has a very wide distribution and attacks many hosts, including the burrowing owl (*Speotyto cunicularia*). The association between these owls and ground squirrels is well known. Mass inoculation of fleas taken from one owl showed that they harboured *P. pestis*, but it is thought that this species of owl is immune; it is evident, however, that the transport of infected fleas from rodents by owls is possible. The vector efficiency of the fleas is now being studied. *C. W.*

i. RALL' (Yu. M.), FLEGONTOVA (A. A.) & SHEIKINA (M. V.). [**Notes on the Biology of the Little Ground Squirrel** (*Citellus pygmaeus* **Pall.**) **in Plague Endemic and Plague-free Areas of West Kazakhstan.**]—*Rev. Microbiol., Epidémiol. et Parasit.* Saratov. 1929. Vol. 12. No. 2. pp. 139–150.

ii. KALABUKHOV (N. I.). [**Dispersal of the Ground Squirrel** (*Citellus pygmaeus* **Pall.**) **as a Cause of Plague Epizootic.**]—*Ber. Mikrobiol. Staatsinst. Rostow.* 1929. Vol. 9. pp. 1–7.

iii. ANONYMOUS. [**Research on the Epizootology of Plague among Ground Squirrels** (*Citellus pygmaeus* **Pall.**) **in an Endemic Focus. Results of the Work of the Northern Caucasus Anti-Plague Organisation, 1926–35.**]—*Rev. Microbiol., Epidémiol. et Parasit.* Saratov. 1934. Vol. 13. pp. 219–222.

iv. KALABUKHOV (N.) & RAEVSKII (V.). [**The Study of Migrations of Ground Squirrels** (*Citellus pygmaeus* **Pall.**) **in the Steppe Areas of Northern Caucasus by Means of the Banding Method.**]—*Problems of Ecology & Biocenology.* 1935. Vol. 2. pp. 170–195. With 5 figs.

v. RALL' (Yu. M.). [**Some Methods of Ecological Census for Rodents.**]—*Problems of Ecology & Biocenology.* 1936. Vol. 3. pp. 140–157. With 1 fig.

vi. FENYUK (B. K.) & SHEIKINA (M. V.). [**A Study of Vole—*Microtus arvalis* Pall. (Mammalia)—Migrations by the Ringing Method.**] —*Sci. Rep. Saratov State Univ.* 1938. Vol. 1 (14). Biol. Ser. No. 2. pp. 85–102. With 2 figs.

These papers are noticed here by title only; they may be valuable to students of sylvatic plague, and English translations of the papers may be had on application to the Director, Bureau of Animal Population, University Museum, Oxford, from whom the price of copies can be ascertained. *C. W.*

MINISTRY OF AGRICULTURE AND FISHERIES. BULLETIN No. 30. pp. iv + 15. With 6 figs. on 4 plates.—**Rats and how to exterminate them, with a Note on Grey Squirrels.** 1941. London: H.M.S.O. [6d.]

GIRARD (G.). Le traitement de l'infection pesteuse par les corps sulfamidés. Peste expérimentale et peste humaine. [**Treatment of Plague by Sulphonamides, Experimental and Human.**]—*Bull. Soc. Path. Exot.* 1941. Vol. 34. Nos. 1–3. pp. 37–48.

The present memoir records the completion of work of which a preliminary note has already been published [this *Bulletin*, 1939, Vol. 36, p. 971]. Guineapigs were chosen in the experimental work for reasons which are given in full. The mode of infection was to rub the shaven skin with wool soaked in a suspension of infected guineapig spleen. In the main, two preparations have been tested: (1) M. & B. 693 (Dagenan) and (2) 1,162 F (Septolix, bacteramide). Comparisons are drawn between chemotherapy and serotherapy. Sera prepared in Madagascar with strains of avirulent plague have been used in the treatment of bubonic plague and have given 65 per cent. of recoveries. In the guineapig M. & B. 693 proved more efficacious and less toxic than any of the other sulphonamides tested. The following results are of interest:—(1) Only the 693 succeeded in curing such animals (1 out of 2) as were treated 48 hours after infection. No cures, but some prolongation of life, were obtained with 1,162 F and with serum. A combination of serum with 693 showed no superiority over 693 alone. (2) If the curative treatment was started immediately after the infecting dose, serum saved the animals but was followed by extensive adenitis and local suppuration, while 693 gave only a limited reaction that was quickly absorbed. (3) A cure was obtained with 693 of the pneumonia resulting from intratracheal inoculation in 3 guineapigs out of 6, but never with serum. (4) There was no advantage in injecting 693 (Soludagenan) over oral administration. (5) Treatment by 693 had to be prolonged beyond the apparent cure, at about the 6th day, to 15 days at least in order to avoid fatal relapse. (6) The animals cured with 693 appeared to have developed a certain amount of immunity, which enabled them to withstand a new infection 6 to 8 weeks after the first.

In the work on human bubonic plague only 693 and 1,162 F were used. The results were as follows: (A) M. & B. 693, with 15 cures out of 19 adults treated: (1) A dosage of 6, 8 and even 10 gm. was administered daily without sign of toxic effect. A reduction in dosage was made as soon as the patient's condition improved. (2) Soludagenan given strictly intramuscularly was well supported and was sometimes given in daily dosage of 2 to 3 ampoules along with 693 by ingestion. (3) Treatment should be continued for 12 days after fall of temperature in daily dosage of 1 to 2 gm. (B) 1,162 F, with 9 cures out of 11 cases

which included 4 children out of five. A rather low total dosage of 9 to 25 gm. per patient had to be adopted. In some cases serum was combined in the medication.

A total of 37 cases of bubonic plague has been treated with 693 and 1,162 F with or without serum and there have been 9 deaths, or 76 per cent. of recoveries. No cures have been obtained in human cases of plague pneumonia. *W. F. H.*

DE VILLAFAÑE LASTRA (T.), SOSA GALLARDO (Juan) & FERNANDO VIDELA (Luis). Tratamiento de la peste de Oriente por medio del sulfanilamido-tiazol. Consideraciones sobre tres casos tratados. [**Three Cases of Bubonic Plague treated with Sulphathiazole.**]—*Semana Méd.* 1941. May 8. Vol. 48. No. 19. pp. 1073–1079. With 3 charts. English summary.

In the Province of Córdoba plague broke out in April 1940 and by the following February there had been 105 cases, 73 fatal (69·5 per cent. fatality) ; 70 were of the bubonic form, 38 dying (54·2 per cent.) and 35 of the pneumonic form, all fatal.

Details are given of three cases treated with sulphathiazole (Cibazol) ; one came in on the third day of disease, the others on the eighth. Sulphathiazole was chosen in preference to sulphanilamide and sulphapyrdine as being less toxic.

The first was a boy of 6 years ; from an inguinal bubo *P. pestis* was obtained. He was given 4·5 gm. of the drug daily for 4 days (this was thought enough for a boy of 6 years), on the fifth day 3 gm., on the sixth 2·5, on the seventh and eighth days 2·0, and on each of the next two days 1·0 gm. These total 29·5 gm. [the text says 31·5 gm.] without any sign of intolerance. The patient left hospital " quite well " 14 days after admission.

The second, a man of 24 years, with temperature of 41°C., pulse 120, was excitable and delirious and trying to get out of bed. *P. pestis* was obtained by puncture of a right inguinal gland. He was given 10·5 gm. Cibazol daily for 3 days (3 doses of 2·5 gm. and 3 of 1·0 gm.), on 4th and 5th days 6 gm., 6th and 7th 4 gm., 8th and 9th 2 gm., altogether 55·5 gm. Eleven days after he came to hospital, the gland was incised and pus discharged, and the patient left hospital 5 days later.

The third was a man of 18 years, with a left inguinal bubo, admitted on the second day of illness with a temperature of 40°C., pulse 120, somnolent and mentally confused. He too was given 10·5 gm. daily for 3 days, but 8 gm. on the 4th and 5th days, and 6 gm. on the 6th day, a total of 53·5 gm. [stated as 51·5 gm. in the text] ; he left hospital 11 days after admission.

Further trials are to be made of the prophylactic efficacy of this drug. The authors stress the need (or advantage) of large initial doses in treatment. *H. H. S.*

BRITISH MEDICAL JOURNAL. 1941. Nov. 1. pp. 621–622.—**Chemotherapy of Plague.**

OTTEN (L.). **A Live Plague Vaccine and the Results.**—*Meded. Dienst. d. Volksgezondheid in Nederl.-Indië.* 1941. Vol. 30. No. 1/2. pp. 61–110. With 3 charts. [16 refs.]

The use of a live vaccine is a major issue in immunology and Otten has been foremost in his advocacy of the superiority of such a bacteria

vaccine over the more commonly used dead vaccine in plague prophylaxis. Naturally the living organisms of such a vaccine must be avirulent but they must also be truly immunizing for the two characters do not necessarily co-exist. In this full account we have all the important proofs of practicability of production and efficacy set out.

It soon became evident that in testing a plague vaccine experimentally the animal used was of the greatest importance. Any vaccine will protect in some animals such as the white rat, the mouse and the monkey. It is not so with the guineapig and the house rat (*R. rattus diardi*) which are difficult to immunize satisfactorily. Here the living vaccine proved its superiority and showed remarkable immunizing power even with the difficult animals. It did not follow, however, that a good guineapig vaccine was equally effective as a rat vaccine and *vice versa*. In general terms the animals that are most susceptible to plague are the most difficult to immunize and an ascending scale of susceptibility is shown by the series: white rat, mouse, house rat and guineapig. Otten started his investigation of the possibilities offered by a living vaccine and the fortunate discovery of the "Tjiwidej" strain greatly assisted his research. It was a house rat strain, kept as usual at 5°C. in deep serum agar stab culture, which in 4 months' time was found to have entirely lost its virulence. Doses of 5 cc. of a broth culture or a whole agar culture were harmless to house rats and guineapigs. Passage of the strain through rats brought about no change in the non-virulence. But much more important was the finding that this strain possessed high immunizing power for the susceptible animals. The test animals were immunized subcutaneously with a single dose only—from 1–2 agar cultures down to one-millionth or less—and the loss by death from inoculation was under 1 per cent. The infecting dose of the very virulent "Preanger" strain was given 3 weeks later and an 80 per cent. survival of house rats and one of 90 per cent. of guineapigs was obtained.

Investigations were made into the preparation of avirulent strains, which are variants by dissociation obtained by picking off and testing single colonies from stab cultures stored in deep serum agar. It might happen that the first attempt was successful but sometimes success only followed many vain attempts. It did not suffice, however, to assume that the whole of a stab culture was avirulent. Even the original "Tjiwidej" strain itself may still harbour a few virulent organisms, "although in high dilution only avirulent variants could be found on the blood plate." The form of the colony gave no indication whatever of the loss of virulence. When, however, a single completely avirulent variant colony was obtained the spontaneous loss of virulence was not reversible even "under the most favourable colony conditions," but single colony isolation is essential for certainty. Other avirulent strains than "Tjiwidej" have been isolated. These may have antigenic differences from one another, for example strain "Tjiwidej" is a good rat immunizing strain and strain "Soemedang" a good guineapig immunizing strain; nor does the difference in these two strains appear to be dependent on the greater or less proportion of somatic or envelope antigen present in either. It is interesting to note that the two well known strains now in practical use "Tjiwidej" and "E.V." are also rat and guineapig strains respectively. It is thought that man behaves in regard to immunization like the house rat rather than the guineapig. Immunization with any of these strains as living and dead vaccine respectively brought out a huge

difference in favour of the living vaccine, which is, so to speak, the main thesis of this article.

Plague vaccination in man (1935–1939) has been entirely favourable to the use of the living "Tjiwidej" vaccine and its use was initiated by a preliminary alternate case testing. In two subdistricts an accurate registration of the entire population was made, family after family, and these families were alternately inoculated with live vaccine. "Altogether over 37,000 people were vaccinated . . . . The deaths were all examined by means of spleen and lung puncture . . . . In the course of fully five months 1,207 deaths occurred, among which 265 were in cases of bubonic plague." The results were, for 37,435 persons vaccinated, 38 deaths from bubonic plague, and for 44,757 non-vaccinated 213 deaths, a reduction in the mortality (1·01 per 1,000 against 4·75 per 1,000) "down to almost 20 per cent."

The manufacture of the vaccine follows lines similar to those for killed vaccines "apart from the necessity of inoculating with a strong bacillary suspension instead of with an ordinary broth culture, since by the latter method insufficient or too slow growth takes place. The greatest care should, however, be taken in carrying out the various manipulations with regard to sterility . . . . Still the result of every crop, in spite of all precautions remains uncertain and the infection of the concentrated vaccine varies between 0 and 100 per cent. For this reason large quantities have always to be prepared. This has the drawback that on the infection being slight a great stock will still be present after a month, which stock has then to be destroyed, an uneconomical method of working which is, however, not to be avoided, since otherwise there is a risk of shortage of vaccine through possible mishaps." *W. F. H.*

PIRIE (J. H. Harvey) & GRASSET (E.). **A Comparison of the Antigenic Qualities of Certain Strains of Avirulent** *B. pestis*.—*South African Med. Jl.* 1941. July 26. Vol. 15. No. 14. pp. 275–276.

The authors have already shown that live avirulent plague bacilli are more efficacious than dead virulent organisms in producing immunity to *P. pestis* in black rats, and in furnishing potent antiserum in horses. In the present article a comparison has been made between a number of avirulent strains from different sources as regards protective immunization and the preparation of antisera. These strains were the Madagascar E.V. 76, Otten's Tjiwidej rough (T.W.R.), a South African strain "2" of 1904 and "K 120," a strain selected by Rowland some 27 years ago. The results are given as follows:—(1) "T.W.R., 2 and K120 appear to be about equal in immunizing quality, with E.V. 76 rather behind them in order" and (2) "There is no substantial difference seen between the two sera, 12 out of the 24 rats treated with the E.V. 76 serum surviving and 13 out of 24 in the case of the T.W.R. serum." *W. F. H.*

GRASSET (E.). **Live Plague Vaccine as a Prophylactic against Plague.**—*South African Med. Jl.* 1941. Oct. 11. Vol. 15. No. 19. pp. 373–375.

Most of this article deals with the precautions adopted in the preparation and use of live plague vaccine. The two strains used were the E.V. strain of Madagascar and the Tjiwidej strain of Java. It will

be remembered that the former strain is more protective to guineapigs and the latter to wild rats. As it is not definitely known what the human response is to these two immunological types, it was decided to use a mixture of the two types in single dose of 1,000 million organisms. " No signs of reversion to their original virulence have been noticed during the past years in any of these strains " and it seems that the danger is not of acquisition of virulence but loss of the remarkably good immunizing power possessed by these strains. The good antigenic power of the vaccine and its avirulence for guineapigs (subcutaneous injection of 4,000 to 20,000 million organisms) are tested before issue. The product of culture and test " is stored in the ice chest and issued from the fifth to the fifteenth day following its preparation. Local reaction after injection of the full 1,000 million dose was only a moderate . . . swelling," and the temperature usually remained normal. Field trials of the vaccine have already begun. *W. F. H.*

GRASSET (E.). **Plague Immunization with Live Vaccine in South Africa.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1942. Jan. 31. Vol. 35. No. 4. pp. 203–211. [11 refs.]

Immunization with living vaccines is receiving much support. South Africa joins Madagascar and Java in the use of this vaccine in the field. The vaccine suspension consisted of a 24-hour agar growth at 37°C., adjusted to a concentration of 1,000 million organisms per cc. and made from the combined E.V. and Tjiwidej strains. The dose was a single injection of 1,000 million organisms ; local reaction was slight and general reactions were exceptional and moderate. A great deal of care has, of course, to be taken in the preparation of the vaccine which requires bacteriological tests for purity and animal controls. A beginning has been made to use this vaccine in human beings as it has many advantages : single injection allowing of mass inoculation in much shorter time, comparatively little reaction, and economic production. Significant statistical results will be forthcoming in due course for these human inoculations, although " the plague problem in South Africa has . . . not the same importance as in plague endemic countries such as Madagascar, Java or India."

[This appears to be an account of the same work as that reported above]. *W. F. H.*

DONOVAN (Anthony) & HOPKINS (E. D.). El lanzallamas en la lucha antipestosa. Descripción del nuevo método eficaz contra roedores y pulgas de roedores. [**The Use of Flame Throwers in Plague Control.**]—*Bol. Oficina Sanitaria Panamericana.* 1941. Oct. Vol. 20. No. 10. pp. 1007–1015. With 7 figs. English summary.

" At the present time, there are three principal means of combatting bubonic plague : rat-proofing, effective, but not always practicable ; vaccination, which is generally considered relatively ineffective, and which does not eliminate the infection from its rat reservoir ; and rodent destruction, accomplished by poisoning, trapping, shooting, clubbing, poison gases, destruction of nests and burrows, and use of animals such as cats, dogs and ferrets. In the course of the anti-plague campaigns in Peru, a new method of rodent (and flea) destruction has been developed—the " flame-thrower " or fire-torch, hitherto used only in industry and in war. To date the most satisfactory type of

torch used has been one with a four-gallon tank connected with a burner coil by a flexible rubber hose. About one gallon of kerosene per hour is burned in continuous operation, and the flame is said to have a temperature of 2,000°F. The torch can be used on wood, bamboo, or cane surfaces without setting fire to them. It has so far been employed satisfactorily for burning off vegetation from ditch banks; killing rats and fleas in burrows; burning abandoned rat nests with their possibly infected fleas, in mud walls, stone fences, adobe walls and other shelters; killing fleas within infected houses; killing rats, fleas, spiders, bed bugs, ticks, cockroaches, lice, and other vermin in cracks and crevices of walls and floors, in routine sanitation work in dwellings, restaurants, warehouses and other premises; killing rats in sewers; and igniting brush fences (a favorite rat harbor), garbage, and rubbish piles. It is believed that the fire-torch can be effectively used in combatting any disease whose transmitting agent is an insect (flea, bed-bug, tick, louse) which passes part of its life cycle in cracks and crevices in the walls and floors of human habitations, or in the nests and burrows of its animal host. Among such insect-borne diseases are typhus fever, Chagas' disease (American trypanosomiasis), and relapsing fever, as well as bubonic plague."

AMOEBIASIS.

Osburn (H. S.). **Amoebiasis on the Witwatersrand.**—*South African Med. Jl.* 1941. Nov. 8. Vol. 15. No. 21. pp. 431–433.

No account has so far appeared on parasitic infections among the general population of the Witwatersrand, nor indeed have any extensive protozoological surveys been made in South Africa.

With the idea of finding out whether abdominal disturbances could be attributed to protozoal infections, the author made routine stool examinations during a period of four months on 63 patients complaining of abdominal pain, discomfort or diarrhoea. Three were natives, the remainder Europeans. In five patients *E. histolytica* cysts were found, but in only one, a European female with active dysentery, were trophozoites present. Of three European cyst-carriers one only had symptoms attributable to this infection and was considered to be suffering from amoebic ulceration of the caecum.

Philip Manson-Bahr.

Blanco (Carlos M.). Algo sobre la protozoariasis en nuestro medio. [**Protozoal Infections in Vera Cruz.**]—*Rev. Med. Veracruzana.* 1941. Nov. 1. Vol. 21. No. 11. pp. 3539–3544.

The number of persons examined by the author was too small for his findings to have general application. Of 200 who had been given anthelmintic purgatives 110 (55 per cent.) showed protozoa in the stools, *viz. E. histolytica* 6, *E. coli* 10, *E. nana* 11, *Giardia intestinalis* 33, Trichomonas 43, Chilomastix 56. *H. H. S.*

Chang (S. L.) & Fair (Gordon M.). **Viability and Destruction of the Cysts of** *Endameba histolytica.*—*Jl. Amer. Water Works Assoc.* 1941. Oct. Vol. 33. No. 10. pp. 1705–1715. With 6 figs.

The authors have tested the influence, on survival time of cysts of *Entamoeba histolytica* in water, of the addition of chlorine at different

temperatures and *p*H. In addition the effect of increase of concentration of the cysts in the suspension was tested. The procedure was to obtain cysts from culture media, wash them and suspend them in water and then expose them to the chlorine. After exposure the cysts were washed and introduced into an excystation medium to test their viability. In plain water the survival time appears to be unaffected by the quality of the water. It is affected, however, by the temperature. Thus, at freezing point there is a survival of 90 days. This is reduced to 30, 10 and 3 days at temperatures of 50, 68 and 86°F. respectively. The concentration of gaseous chlorine needed to destroy the cysts lies well within the range of practicable superchlorination if the period of contact can be extended to 30 minutes. A rise in temperature of 20°F. reduced the required chlorine concentration by half, while it was reduced by 25 per cent. if the contact time was doubled. If, however, the density of the cysts is doubled a 25 per cent. increase of chlorine is required to destroy the cysts. A similar increased requirement is seen when the *p*H is increased from 7 to 9, while a 50 per cent. decrease occurs when the *p*H is reduced from 7 to 6. In all cases the coliform organisms were destroyed before the cysts.

C. M. Wenyon.

PICK (F.). Beobachtungen an einer Kultur von *Entamoeba histolytica* (Schaudinn). [**Observations on a Culture of** *E. histolytica*.]—*Antonie van Leeuwenhoek, Jl. Microbiol. & Serol.* 1941. Vol. 7. No. 1. pp. 13–24. [Summary taken from *Biol. Abstr.* 1941. Dec. Vol. 15. No. 10. pp. 2295–2296. Signed J. C. HOOGERHEIDE.]

Addition of insulin to the culture medium improved the growth of *E. histolytica*. The best culture medium was made as follows: Take 1 cc. solidified Bacto-liver infusion agar with 2 cc. serum-Ringer soln. on top; with a Pasteur pipette deposit a 1-mm. layer of the following suspension between solid and liquid phase—to 10 drops of insulin (40 units/cc.) add 10 loopfuls of rice starch and 5 loopfuls of $CaCO_3$. In this medium growth is luxurious and amoebae are arranged in the form of nests, as if agglutinated, and similar to their arrangement in vivo. They are very motile and many giant forms are present. Sheep erythrocytes are attracted and accumulate as a bouquet on the surface of the amoeba, indicating polarization. Cysts also attract erythrocytes and they accumulate in a ring around the cyst, but a little distance away (may be used as diagnostic criterion for cysts). Occasionally pseudopodia protrude from the amoeba, rotate around their base, thus taking the shape of steel-scrapings, and then envelop the body and unite again with the base. Pyocyanin gives good vital staining.

KARUNARATNE (W. A. E.). **The Pathology of Amoebic Hepatitis including a Consideration of the Pathogenic Rôle of the** *Entamoeba histolytica*.—*Jl. Ceylon Branch Brit. Med. Assoc.* 1941. June. Vol. 38. No. 2. pp. 95–176. [Numerous refs.]

This contribution, like its predecessors, consists of an extensive, detailed and, indeed, a learned exposition of hepatic amoebiasis, and as such, will no doubt be regarded as a fund of information for future historians of this subject. If criticism may be permitted on such a thorough study, then it may be said that too much reverence has been paid to the written word of the past at a time when the exact rôle

of *Entamoeba histolytica* was neither so well known nor appreciated as it is at the present day. The conflict between the past and the present is therefore apt to have a confusing effect upon definite conclusions. The importance attributed to alcohol as a predisposing factor in amoebic infection of the liver bears a distinct Victorian aroma, as do also the quotations from the Barrack Room Ballads upon this subject.

The statement (p. 143) that the liver complication of bacillary dysentery is in the nature of multiple small abscesses whilst the common complication of amoebic dysentery is a large solitary abscess is certainly not in accordance with modern knowledge.

The conclusions from the evidence brought forward may be stated as follows :—

The high mortality in Europeans in the first year of residence in the tropics is probably due to a want of adaptation to new environment rather than to lack of immunity owing to absence of previous infection. It is therefore necessary to assume the existence of various grades of susceptibility in the individual, or else to postulate varying degrees of virulence of the parasite in order to explain the varied manifestations of amoebic infection and its equally fortuitous response to treatment, and the disappearance of symptoms in the absence of such treatment.

Other points noted are the rare occurrence of abscess of the liver, in spite of the alleged frequency of parasites in this organ, the greater susceptibility of the European immigrant and the marked resistance [?] shown by women and children to this complication—all of which emphasize the extraordinary relationship which exists between parasite and host. There are, doubtless, other factors of which we are at present unaware which may influence the aetiology of amoebic infection ; for instance that of the frequent concomitant bacterial infection both in intestine and liver.

There is yet much to be learned regarding the pathogenic potentialities of *Entamoeba histolytica*, as well as the important and fundamental question as to the factors which make the amoeba produce disease in man. *P. M.-B.*

DE PAULA (Homero Vianna) & FROTA (Paulo). Aspectos cirurgicos das protozooses. [**Surgical Aspects of Protozoal Infections.**]—*Brasil-Medico*. 1941. July 19. Vol. 55. No. 29. pp. 493–507. With 1 fig. [31 refs.] English summary.

This is an interesting and comprehensive article dealing with the subject under the following heads : (1) The surgical complications of amoebiasis, notably occlusion and subocclusion, tumours of the colon occurring in amoebiasis, acute amoebic appendicitis, a " peritoneal syndrome " due sometimes to actual perforation but sometimes in the absence of any such lesion, hepatic abscess, pleurisy and empyema from abscess of liver. (2) Protozoal infection simulating disease of a surgical nature, such as symptoms indicative of acute, subacute or chronic appendicitis, dyspeptic symptoms and duodenitis simulating peptic ulcer, a pseudo-cholelithiasis due to Giardia, and an analogous pseudo-nephrolithiasis. (3) Protozoal infection complicating diseases requiring surgical measures, such as appendicitis in a patient with amoebiasis, or cancer of the bowel, salpingitis and a number of other conditions. Illustrative cases are recorded of most of the conditions referred to. The authors sound a note of warning that abdominal

operations in patients with latent amoebiasis are commonly followed by a renewal of amoebic activity or of the symptoms due to them, and it is advisable, therefore, that patients suffering from amoebiasis who have to undergo operation, should, if there is time and operation not urgent, be treated first for the protozoal infection; if there is urgency then the treatment might be taken up at the same time.

H. H. S.

PRUYS (W. M.). Over het leverabsces in de tropen. [**Liver Abscess in the Tropics.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1941. Sept. 9. Vol. 81. No. 36. pp. 1894–1906. With 4 figs. on 1 plate. Also in *South African Med. Jl.* 1941. Nov. 8. Vol. 15. No. 21. pp. 427–431.

Although emetine injections have done much to bring about disappearance of liver abscess the condition still requires diagnosis and treatment. The author has—out of a total of 2,475 operations—dealt surgically with 22 cases in 9 years. He is not prepared to subscribe to the opinion that the excessive use of alcohol and opium smoking are factors of much importance in the development of liver abscess. The following points are set out as of diagnostic importance: (1) A negative history of dysentery is of little significance. (2) Jaundice is more likely to be diagnostic of carcinoma, syphilis or gallstones than of liver abscess. (3) A soft enlarged painful liver with rounded edge is found in all cases of liver abscess. Friction on auscultation, synchronous with respiration, may be observed, and sometimes shoulder pain. (4) A blood examination may show leucocytosis with slight left shift and moderate toxic granulation. Sedimentation rate is markedly increased (50–140). (5) X-ray examination is very valuable and should show a cupola-like displacement of the right or left half of the diaphragm. (6) Amoebic cysts may be found in the faeces, but a negative result may also be obtained. (7) Slight elevation of temperature is the rule and there is some increase of the pulse rate.

Treatment consists in (1) aspiration of pus, (2) injection of emetine into abscess cavity and then subcutaneously, (3) surgical operation. In cases of doubt an exploratory laparotomy is recommended.

W. F. Harvey.

SANDES (John D.). **Amoebic Liver Abscess in Northern Ireland.**—*Brit. Med. Jl.* 1942. Feb. 7. pp. 184–185. With 2 figs.

A case of hepatic abscess presenting two or three anomalous features. The patient was a soldier who had been in Cairo for one month and at Mersa Matruh for eight months five years before coming under the author's observation. He stated that he had never suffered from dysentery, but it must be remembered that, in the first place, there may be lesions of quite an extensive character without any subjective symptoms, and, in the second, patients often forget a previous attack of dysentery if it was not severe, and may have had what they considered at the time as "just a go of diarrhoea" and have forgotten it. Another unusual feature was absence of pain or tenderness on the right side and of shoulder pain, but "definite tenderness in the left lumbar region posteriorly," although the abscess was in the right lobe of the liver. The fact that no amoebae were found on examination of the liver pus removed is not an uncommon experience. *H. H. S.*

LEE (Raymond S. H.). **Amoebic Granuloma simulating Epithelioma of the Anus.**—*Caduceus.* 1941. Aug. Vol. 20. No. 3. pp. 176–177.

DONALD and BROWN [*Proc. Staff Meeting, Mayo Clinic*, 1940, Vol. 15, No. 21] have drawn attention to this complication which, if not immediately recognized, may lead to unnecessary surgical intervention.

The subject of this report was, indeed, wrongly diagnosed in the first instance and partially treated as epithelioma of the anus before the discovery of *E. histolytica* cysts.

The patient, a Chinese woman of 41, gave a two months' history of anal swelling mistaken for piles. Intense pain had been experienced and there was loss of weight. A perianal ulcerated mass with everted edges was present; this extended into the anal canal and was accompanied by enlarged and hard inguinal lymphatic glands. The patient was also suffering from diabetes. A transverse colostomy was performed, after which examination of faeces revealed cysts of *E. histolytica*. With emetine injections 1 gr. for 12 treatments and quinoxyl enemata the granuloma and attendant swellings of inguinal glands entirely disappeared.

The colostomy being closed, uneventful recovery took place.

P. M.-B.

DAYALU (T. K.) & JAYARAM (S. S.). **Entero-Vioform in Amoebiasis.**—*Med. Bull.* Bombay. 1941. Oct. 18. Vol. 9. No. 20. pp. 613–616.

It is claimed that the treatment of amoebiasis has been largely solved by the introduction of Entero-vioform and the authors go so far as to claim that this disease, in Bangalore, if uncomplicated, can always be cured by the judicious use of this drug, with the aid of adjuvants, as occasion demands.

As is well appreciated, amoebiasis is protean in its manifestations. It is claimed here that cases range from those with symptoms suggesting slight vitamin B_1 deficiency to those with hepatitis and conditions resembling abdominal tuberculosis. It is not an infrequent cause of secondary anaemia. The patients in this series (nine in number) were treated as in-patients and exhibited typical blood and mucus in the stools, with amoebae, pus and red cells. There were no failures, though a few required a second course. Entero-vioform is especially indicated in children who are liable to the toxic effects of emetine; no toxic effects were noted except gastric irritation. For an adult the dose is four pills daily for the first five days; thereafter the number is reduced. [The tablets presumably contained 0·25 gm. of the drug each, though this is not stated.] Tenesmus and griping are relieved almost instantaneously by a retention enema of two pills in one ounce of water. In all acute cases the amoebae disappear from the stools in seven days. Blood and mucus cease in 2–3 and diarrhoea in 4–5 days. A table is given setting out details in nine cases. It is to be noted that no less than six also received "adjuvant treatment" of emetine injections. [The dullness of statistics is enlivened by such phrases as "plethoric lady" and "child turned a new leaf." The impression is gained that this is an example of entirely uncritical work and there appears to have been no attempt at a follow-up.] *P. M.-B.*

LIU (Shao-kwang), CHANG (Yao-teh) & CH'UAN (Tz'e-kwang). **Yatanine, an Antiamoebic Drug. A Preliminary Report.**—*Chinese Med. Jl.* 1941. Sept. Vol. 60. No. 3. pp. 229–231.

Ya-tan-tzu or K'u-shen-tzu has been used empirically for dysentery for centuries. It is derived from the seed of Brucea sp. and seems to be the same as Kô-sam [see this *Bulletin*, 1937, Vol. 34, p. 955]. The kernels contain essential oil, fat, phytosterol, sugar, glucosides, saponin, tannins and alkaloids. Yatanine is the name given to the alkaloid for extraction of which the following procedure is adopted :—

"*Extraction.*—The extraction of alkaloid was proceeded with according to S. K. Liu's method. The treated powder, faintly acid, was digested under reflux condensation with 80% ethyl alcohol. Digestion was discontinued as soon as the alcohol started to boil. The alcoholic extract was concentrated to form a syrupy mass, and then was slightly acidified with hydrochloric acid. This was warmed to 70°C. The insoluble fats, oils, phytosterols and other impurities were filtered off. The filtrate was further dried to form a semi-solid mass, again faintly alkalized, and finally digested with ether until the ether just boiled. Through successive digestion and purification with ether, the white base, *Yatanine*, was obtained."

Whereas the whole seeds cause gastric irritation, with nausea and vomiting, and the essential oil is a powerful irritant causing itching, swelling, inflammation and even vesication, which might persist for a week, defatted kernels had none of these effects. Adults suffering from amoebic dysentery were given 1–2 gm. of dried defatted kernels in tabloid form, or 30–60 kernels on the first night, and on the two following days, 0·4–0·8 gm. (or 10–20 dried kernels) thrice daily after meals. On the fourth day half this was given daily for a fortnight. Tenesmus was relieved and the number of stools reduced by the second day, thenceforward improvement was steady. Entamoeba disappeared within a week, in some this result was obtained when yatren, carbarsone and emetine had failed.

Yatanine immobilized infusoria rapidly and in a dilution of 1 in 10,000 killed them in a short time. [The author does not mention the dose of the alkaloid itself alone, nor does he mention having tried it in human cases of amoebiasis.] *H. H. S.*

KUZELL (William C.), LAYTON (Walter B.), FRICK (W. D.) & CUTTING (Windsor C.). **General Actions, Toxicity and Clinical Effects in Amebiasis of Kosam, an Oriental Amebicide.**—*Amer. Jl. Trop. Med.* 1941. Nov. Vol. 21. No. 6. pp. 731–738.

Kosam, an old oriental remedy for diarrhoeal conditions, is the seed of *Brucea javanica*. The claims of benefit in the treatment of amoebic dysentery [see this *Bulletin*, 1937, Vol. 34, p. 955] needed confirmation or refutation, and the authors undertook an investigation to determine this. Their study comprised three parts :—

1. Comparison between it and nearly a score of other drugs (including emetine hydrochloride, vioform, carbarsone, yatren, members of the sulphonamide group and others) on cultures of *E. histolytica in vitro*. The results compared favourably with several others, but kosam was no better than some of the rest.

2. Tolerance and toxicity in mice, rats, guineapigs, dogs and cats. The drug caused gastric irritation, as it does in man, but without indications of systemic poisoning ; nausea and vomiting were common.

3. Clinical trials in seven human subjects with amoebiasis. In five the nausea was troublesome, two remained positive, three others relapsed after temporary improvement and benefit. The doses given should have been adequate, 100 seeds in two days or 200 in six days, in another 240 in twelve days.

Briefly, the good reports of its use could not be confirmed by the authors. *H. H. S.*

BACILLARY DYSENTERY.

WILSON (W. James) & BLAIR (E. M. McV.). **A Tellurite-Iron-Rosolic Acid Medium Selective for** *B. dysenteriae* **(Flexner).**—*Brit. Med. Jl.* 1941. Oct. 11. pp. 501–503. [Summary appears also in *Bulletin of Hygiene.*]

The observation that the addition of tellurite to MacConkey's medium inhibited most coli-aerogenes strains without fully inhibiting strains of Flexner's bacillus was followed by the discovery that the further addition of appropriate amounts of iron citrate or iron alum converts the tellurite to a form which permits the rich growth of *Bact. flexneri* and yet inhibits *Bact. coli* to a very large extent. The purpose of the rosolic acid is to inhibit *Strep. faecalis* and also to act as an indicator. The recommended medium is prepared as follows:

"To 100 cc. of melted nutrient agar cooled to 60°C. in a flask are added 0·5 cc. of 1 per cent. rosolic acid dissolved in absolute alcohol, 1 cc. of a 4 per cent. watery solution of iron alum and finally 3 cc. of a lactose-tellurite solution. The latter solution is made by boiling 20 grammes of lactose in 100 cc. of distilled water, cooling the solution, and then dissolving in it 0·2 gramme of potassium tellurite. It is necessary to dissolve the tellurite in the cold, otherwise reduction occurs. This lactose-tellurite solution keeps for weeks, the tellurite being an effective preservative against bacteria, but not against moulds: growth of the latter can be prevented by the addition of 3 per cent. of ether and keeping the bottle tightly stoppered."

Plates are poured and allowed to set with the lids removed. A large loop of a thick faecal suspension is spread on the medium and allowed to dry. In 18 hours the pink colonies of Flexner's bacillus are readily distinguished from any yellow colonies of resistant *Bact. coli* and can be confirmed by slide-agglutination and confirmatory tests. On this medium the growth of typhoid-paratyphoid bacilli, Sonne's bacillus, the cholera vibrio and all of twenty species of Salmonella food-poisoning organisms is completely suppressed.

J. C. Cruickshank.

LANCET. 1942. Jan. 3. pp. 20–21.—**Treatment of Bacillary Dysentery with Sulphaguanidine.**

It is welcome to read a report to the War Office upon the use of sulphaguanidine in the treatment of bacillary dysentery in the Middle East by N. H. FAIRLEY and J. S. K. BOYD. So far the drug had been reserved for severe and persistent chronic cases, and the restriction has often led to delay in commencing treatment. Out of some 371 cases, 135 were due to Shiga infection. This preliminary report deals mainly with these.

The effects are : increased feeling of well-being, within 24–48 hours of administration, rapid relief of abdominal pain and tenesmus with decrease of abdominal symptoms—together with a fall in temperature and pulse-rate. A remarkable reduction in the number of stools takes place and as a rule, within 5–6 days, the bowels act once or twice daily. At the same time there is rapid disappearance of blood from the faeces, though mucus takes much longer to disappear.

The earlier the treatment with sulphaguanidine, the less extensive is the damage to the colon and the more rapid convalescence and recovery. The most dramatic cures were naturally in acute cases treated within 24–36 hours from the onset. Of 12 cases in which treatment was not commenced till a late date (21st day and over) three were listed as possible failures. They were all chronic cases of bacillary dysentery and it is probable that full courses of treatment in the first instance would have produced cure.

There were five fatal cases in which sulphaguanidine treatment was attempted, but they were apparently very severely ill or moribund before treatment was commenced and information is lacking regarding the total quantity of the drug administered. There were other complications, such as cerebral thrombosis, bilateral hydronephrosis and lobar pneumonia. Although no analysis of cases other than of Shiga infection is given, cases of dysentery due to Flexner, Schmitz and Sonne infections treated with sulphaguanidine have been restored to health and rapid healing of the colon observed by sigmoidoscopy. The action of sulphaguanidine is either bacteriostatic or bactericidal, leading to cessation of damage and decrease in toxin production. It appears to exert no effect on dysentery exotoxin already absorbed, but in Shiga dysentery this can be neutralized by intravenous injection of Shiga antitoxin. Therefore sulphaguanidine and antidysenteric serum are mutually complementary and therefore in fulminating Shiga dysentery both are indicated.

Toxic manifestations were mild—mainly headache associated with malaise and occasional transient erythematous or papular eruption. No cases of haematuria were recorded, and toxic nephrosis (toxaemic nephritis), which may complicate bacillary dysentery, has no relationship to the administration of the drug. *P. M.-B.*

[In a recent Army Medical Directorate Bulletin the following doses of sulphaguanidine are given :—

In the acute cases the average dose was 20 gm. per diem, with an aggregate of some 135 gm. for each case. For mild acute cases of Shiga infection the recommended dose for adults is 20 gm. each day for the first two days, and 10 gm. each day for the next three days.

In individuals who are not ill, but from whom true dysentery bacilli can be recovered the doses suggested are 18 gm. in the first 24 hours, administered in 6 gm. doses three times a day after meals ; subsequently 3 gm. three times a day for five days.—*Ed.*]

EDWARDS (Lydia B.). **Sulf guanidine in the Treatment of Bacillary Dysentery.**—*Southern Med. Jl.* 1942. Jan. Vol. 35. No. 1. pp. 48–53. With 1 fig. & 1 chart.

This paper consists for the main part of a résumé of the literature of sulphaguanidine, which has been adequately reviewed in this *Bulletin.*

An attempt has been made to estimate the concentration of sulphathiazole in the stools of patients receiving this drug, and to contrast the

results with those already obtained with sulphaguanidine. These investigations were conducted in infants in whom it was impossible to avoid contamination of the stool with urine, so that a certain degree of error was bound to creep in.

The preliminary results suggest that, in large oral doses, sulphathiazole may be present in fairly high concentration in the stools, though usually below saturation. The lowest values were usually observed in normal, not in diarrhoeal stools. In comparing these two drugs it is interesting to note that in 33 children taking sulphaguanidine no definite toxic reactions occurred, whereas in 281 children receiving sulphathiazole up to June 1941, approximately 9 per cent. developed toxic symptoms.

In the discussion on this paper G. M. LYONS confirmed his views on sulphaguanidine in the treatment of severe or moderately severe forms of acute bacillary dysentery. In association with L. C. HALL he was now able to present a study in which alternate patients were treated with sulphaguanidine ; the others being observed as controls. The Flexner (Hiss-Y) type was the organism most commonly encountered. Failures were encountered in those who presented other significant clinical features such as pyogenic infection, a history of diarrhoea for more than a week before chemotherapy, or alternatively a diarrhoeal disease of a serious nature within 4–6 weeks before sulphaguanidine treatment.

This report also confirms the almost complete absence of any significant evidence of toxicity, the ease and simplicity with which the drug could be administered and the early disappearance of nausea, vomiting and malaise. A further study of nearly 300 patients was undertaken to test the practicability of this drug in the out-patient department of a baby clinic, in general practice and in the homes of private and clinic patients. Eight of patients so treated died, only one of whom received more than four doses of sulphaguanidine. One patient who had received what was considered to be adequate dosage died of some unspecified diarrhoeal disease. One-third were hospitalized, but it was found that the effectiveness of this drug made possible a very marked reduction in the number of patients admitted to hospital. In the hospital group most had the severe form of the disease ; 51 had pasty stools and became afebrile in three days or less ; 6 in four days ; 7 in five days and one each in six and nine days respectively. In all, 259 patients (excluding the neonatal group) were treated with sulphaguanidine. Of these 195 passed normal pasty stools and were afebrile in three days or less, 21 in four days, 17 in five days and 1 each in six and nine days respectively. Such results were unobtainable by previous methods of treatment.

This experience in the dosage recommended by MARSHALL showed that, when so employed, sulphaguanidine is safe in dispensary and out-patient practice for " bloody flux ", and is a much safer drug than sulphathiazole. Relapses occurred almost exclusively in those receiving inadequate dosage. On the basis of this experience it is recommended that sulphaguanidine should be given as early after onset as possible ; every 4 hours for 3 days, then every 8 hours for 2 days more.

R. E. CHING, who admitted that his experience with sulphaguanidine was limited, was satisfied with sulphathiazole (in 23 cases) given in 3–4 gm. doses initially, followed by 1 gm. four hourly. The blood levels varied from a trace to 8·5 mgm. per cent. [See also this *Bulletin*, 1941, Vol. 38, pp. 596–600.] *P. M.-B.*

SUAREZ (Ramon M.) & MORALES (Federico Hernandez). **The Treatment of Bacillary Dysentery. Preliminary Report on the Use of Sulfaguanidine.**—*Bol. Asoc. Med. de Puerto Rico.* 1941. Sept. Vol. 33. No. 9. pp. 347–358.

In a study of a series of 30 cases of bacillary dysentery the authors were in the main able to confirm previous knowledge upon the action of this drug. All but one were acute cases. Sulphaguanidine was used in 17, whilst 13 served as controls, receiving symptomatic treatment only, consisting of starvation diet and adequate fluid intake. The main infecting organism was Flexner's bacillus—the Newcastle bacillus was present in 5 and Sonne's bacillus in 1.

Seven were children below 1 year of age: seven from 1 to 7, sixteen from 23 onwards. No deaths occurred in the sulphaguanidine series, nor in the controls. Out of the 13 treated symptomatically 3 recovered as rapidly as those on chemotherapeutic treatment, but the remaining 10 went through the familiar prolonged clinical course. There were 3 relapses as compared with 1 only in the sulphaguanidine series. The reappearance of Flexner bacilli in the stools of a few cases may be due to relapses or even fresh infections.

The initial dose of sulphaguanidine was 0·1 gm. per kgm. of body weight and 0·05 gm. every four hours until the number of stools was reduced to four in twenty-four hours; then 0·1 gm. per kgm. every 8 hours for at least three days.

The total dosage was often very large—much more so than in any other communication hitherto reported. For instance one adult male (33) received 164 gm. in eleven days. There were no toxic manifestations except a mild skin rash.

In one instance sulphaguanidine (total 24 gm.) did not appear so effective. This patient had severe ulcerative colitis so extensive as to necessitate caecostomy, but he also had concomitant malaria (*P. falciparum*) and Flexner bacilli had on occasions been isolated from the stools. It is concluded that sulphaguanidine shortens considerably the clinical course of acute bacillary dysentery, acts better when given early in the disease, but may exert a favourable influence, even when administered on the 10th or even 15th day of illness.

P. M.-B.

CORWIN (Warren C.). **Studies on the Chronic Toxicity of Sulfaguanidine (Sulfanilylguanidine).**—*Bull. Johns Hopkins Hosp.* 1941. July. Vol. 69. No. 1. pp. 39–52.

The preparation, chemical and physical properties of sulphaguanidine have already been adequately described. On the basis of experiments on mice, rats and dogs, it has been concluded that, when given by the mouth, it is probably less toxic than sulphapyridine and sulphathiazole. This compound is conjugated in the mouse, rabbit and man, but not in the dog; the toxic effects in rabbits were due to deposition of acetylsulphaguanidine in the collecting tubules and pelvis of the kidneys. At the meeting of the Southern Surgical Association (Dec. 1940, unpublished) it was stated that the reduction of the number of bacteria in the alimentary canal produced by sulphaguanidine, though not always striking, was always sufficient to permit operation without the usual risk of infection.

Since in previous studies sulphaguanidine has not been employed in dogs for more than one week and since monkeys had not been used, the present study was undertaken to determine the pharmacological effects and pathological changes resulting from administration of the drug to dogs and monkeys (*Macaca mulatta*) for a period of one month. The drug was also administered to rabbits.

The effect of sulphaguanidine on stool cultures from dogs and monkeys does not in these animals result in a decrease in the number of bacteria. An interesting finding has been the reversal of the differential count in all instances. The Gram positive organisms, especially cocci, increase at the expense of Gram negative bacilli. In some cases the latter completely disappeared. It is evident that reversal of the differential count begins almost immediately.

Observations on blood concentration-time curves bear out the claims already made for sulphaguanidine.

In agreement with the findings of MARSHALL and his colleagues, sulphaguanidine was found extremely toxic for rabbits, owing, apparently, to the fact that rather large amounts of the drug are absorbed and a very high percentage converted into the acetylated form. In consequence the collecting kidney tubules are obstructed by sulphaguanidine. Subsequently there occurs a further rise of the level of the drug in the blood, particularly of the acetylated form, with consequent retention of nitrogenous waste products.

The urine obtained, either by catheterization on the fifth day, or taken directly from the bladder after death, revealed a great amount of sediment, mainly composed of very characteristic crystals 5–30μ in breadth and 15–30μ in length. On analysis these were found to be composed of 74·1 per cent. acetyl sulphaguanidine and 6·4 per cent. free sulphaguanidine. No significant changes were noted in the haemoglobin values or red and white blood cell counts.

Necropsy findings in rabbits showed identical pathological changes in the kidneys and spleen. Grossly the kidneys were large, soft, boggy and pale. On the cut surface the collecting tubules stood out as yellowish glistening streaks radiating fanwise from the central medullary papilla. This delineation was found to be due to the packing of crystals.

Microscopically the tubules and glomerular spaces were dilated and contained albuminous fluid, casts and débris.

The spleen was much reduced in size, microscopically these changes lay in atrophy of the Malpighian corpuscles and splenic pulp.

All dogs remained well during the 28 day period of administration of the drug. There were no constant urinary findings, except that on two occasions the sediment obtained by centrifugation of the urine contained large numbers of leucocytes and needle-like crystals.

In view of the large dosage employed, the blood levels of sulphaguanidine remained remarkably low throughout the experimental period. This was to be expected as dogs do not conjugate sulphaguanidine as in the cases of other sulphonamide compounds.

All six monkeys remained well. Only one failed to show at one time or another crystals (presumably sulphaguanidine) on microscopic examination of centrifuged urine.

The blood levels of sulphaguanidine remained low throughout the experiment. The percentage of acetylation averaged 40 per cent.

P. M.-B.

COOPER (Merlin L.), ZUCKER (Ralph L.) & WAGONER (Stewart). **Sulfathiazole for Acute Diarrhea and Dysentery of Infants and Children. Statistical Analyses** by Mrs. Estelle W. BROWN and Ruth BENNETT.—*Jl. Amer. Med. Assoc.* 1941. Nov. 1. Vol. 117. No. 18. pp. 1520–1523.

Studies on mice by Cooper showed that one dose of 2 mgm. of sulphathiazole or sulphapyridine administered by stomach tube three hours after infection with *Shigella paradysenteriae* resulted in survival of all mice inoculated with two minimum fatal doses.

The stools of 59 (47·9 per cent.) of 123 patients suffering from acute diarrhoea were positive for either *S. paradysenteriae*, Flexner or Sonne. All were classified into age groups on admission and alternate patients in each age group were treated with sulphathiazole.

Four factors were selected for statistical analysis and evaluation of the efficacy of the drug. These were (1) the length of time from admission to hospital until the temperature became normal; (2) the length of time from admission until the patients' temperature became less than 100°F. (rectal); (3) the length of time from admission until the stools became normal; and (4) the length of time from admission until the patient had apparently completely recovered.

Statistical analysis showed that sulphathiazole was distinctly of therapeutic value in patients whose stools were positive for *S. paradysenteriae* but had no effect on those whose stools were negative to this organism. Six patients died, five of whom had negative stool cultures, and only one had sulphathiazole treatment.

The data certainly indicated that sulphathiazole hastens the disappearance of *S. paradysenteriae* from the stools, whilst 17 out of 34 who did not receive sulphathiazole had positive stool cultures when discharged from hospital. *P. M.-B.*

COELHO (G.). **Sulfapyridine and Banana in the Treatment of Diarrhoea of Children.**—*Med. Bull.* Bombay. 1941. Aug. 16. Vol. 9. No. 16. pp. 497–499.

In 39 cases the stools of 17 contained blood and mucus, and most of the patients had fever. Treatment consisted of sulphapyridine given every 4 hours, ½ tablet for infants, ⅔ tablet for children aged 2 to 5, 1 tablet for older children. Each tablet contains 0·5 gm. For the first 12 hours weak tea was given, and after that, mashed banana seived through a cloth, or even unmashed banana to older children. Banana was given every ¼ hour, and fluid administered as required. Stools were reduced to less than 4 in 24 hours in periods of 1·6 to 3 days, and signs of toxicity soon disappeared. *C. W.*

BOBROVOLSKAIA (V. V.). [**Sulphadine Therapy in Dysentery.**]—*Soviet Vrachebnii Jl.* 1941. Apr. p. 277.

In the Vassileostrovski children's hospital sulphadine was given to such patients as were suffering from dysentery complicated by pneumonia, and it was found that the effect was beneficial not only on the pneumonic condition, but also on the dysentery. Even in 6 children who died it was found at autopsy that intestinal damage was undergoing repair after this treatment. Later, the drug was given in 34 cases of uncomplicated dysentery in infants. By the second day

of treatment blood had usually disappeared from the stools even when haemorrhage had previously been free. The frequency of the stools diminished quickly, and they became normal, in 14 cases at the end of the second day. The daily doses did not exceed 0·7 gm. (minimum 0·3) and the total quantities given in uncomplicated dysentery varied from 0·6 to 1·1 gm. Sulphadine therefore appears to be remarkably effective in this disease. *C. W.*

SOESMAN (J.). De polyphaagbehandeling van bacillaire dysenterie in de algemeene praktijk. [**Polyvalent Bacteriophage in the Treatment of Bacillary Dysentery.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1941. Sept. 2. Vol. 81. No. 35. pp. 1863–1874. English summary.

"Report of fifty cases of bacillary dysentery in adults (17 cases) and children (33 cases), treated with polyphage (polyvalent bacteriophage). All cases recovered and in most of them the severe symptoms disappeared rapidly after oral administration of the phage. In our opinion, the polyphage is a valuable asset in our armament against acute bacillary intestinal infections." [See also this *Bulletin*, 1942, Vol. 39, p. 36.]

GENERAL DEFICIENCY DISEASES.

KIREMERWA (D. N.). **Deficiency Diseases in Karamoja, Uganda.**—*East African Med. Jl.* 1941. Nov. Vol. 18. No. 8. pp. 242–245.

[The author is African Assistant Medical Officer, Moroto Hospital.]

Scurvy is rare in Uganda, but cases have been found in the long-term prisoners at Moroto. Their diet consists of maize, simsim, meat, salt and beans; millet may be used, but greens and lemons are only rarely added to the diet. The natives in the district use milk, blood, millet, meat, with seasonal additions which include greens, but maize is becoming more popular because easily obtained. The author failed to find scurvy in these people, in spite of search, but records 12 cases in the prison (of which two were in persons not prisoners). He suggests the addition of germinating beans and lemons to the diet, with greens, millet stems and millet beer. These would not be expensive.

He reports a case of beriberi in a prisoner who had received much the same diet except that he would not eat beans. *C. W.*

RAYMOND (W. D.). **Reasons for a Nutritional Policy in Tanganyika.**—*Tanganyika Territory Med. Dept. Med. Pamphlet. No. 35.* Dar es Salaam. 1941. 6 pp.

In the introduction the importance of the study of nutrition is emphasized. Little information about the state of nutrition in Tanganyika is available, but night blindness, pellagra and scurvy occur. The calcium intake is low (0·3–0·4 gm.) but there seems to be an adjustment to this intake. Fruit and vegetables are not used as fully as they might be and cooking is almost non-existent. The composition of many native foods is unknown. Supplies of fish, meat, calcium and occasionally salt are inadequate. Little is known about the diets of estate labourers except in the sisal industry. Their ration

was 24 oz. maize meal and 6 oz. beans daily, 8 oz. groundnuts and 8 oz. fish or meat weekly, but there are signs that improvement is imminent. Sickness and apathy are common. Since the employers value efficiency it should not be difficult to get them to provide better diets. The author urges nutritional surveys, assays of local foods, an agricultural policy designed to remedy dietary deficiencies, and dietetic education of the African and his employer, and scientific soil development. *H. N. Green.*

TANGANYIKA TERRITORY. MEDICAL DEPARTMENT. Medical Pamphlet No. 29 (2nd Edition). **Suggestions for improving the Feeding of Labourers in Tanganyika** [MCKENZIE & PLATTS (S. A.)]. 10 pp. 1941. Dar es Salaam. Govt. Printer.

A useful pamphlet intended especially for employers of labour, and written in non-technical language. *C. W.*

SQUIRES (Bernard T.). **Early Signs of Deficiency Disease in South African Natives.**—*South African Med. Jl.* 1941. Nov. 22. Vol. 15. No. 22. pp. 449–450. With 2 figs.

The author commences his article with the statement :—" Although the literature upon various aspects of deficiency disease has now reached enormous proportions, only a small part deals with those complaints from the clinical standpoint, and a still smaller part with the early signs." This hardly seems fair to this *Bulletin* which for a number of years has drawn attention to these conditions. It is noted that no references are given to the *Bulletin* and none to the many papers reviewed therein.

The author gives some notes of conditions met with among 2,000 South African natives treated in South African native reserves and in Bechuanaland. He comes to the same conclusion reached by many others, that single deficiency states are rarely met with. His opinions on the question of deficiency are presumably based entirely on the dietetic history. He says the eye and its appendages are involved early in simultaneous vitamin A and B_1 deficiency and then describes the well-known conditions commonly written down as due to A avitaminosis. No mention is made of those other conditions now considered to be due to riboflavin deficiency. There is no mention either of the amblyopia (retrobulbar neuritis) found by Fitzgerald MOORE in West Africa.

Changes in the skin met with by the author include " angular stomatitis, eczematous conditions of the ano-genital region and phrynoderma," also glazing and hyperpigmentation of the skin of the shins. Attention is also called to a patchy depigmented condition of the skin of covered parts of the body and limbs, which, since improvement occurs when cod liver oil and yeast are given, the author believes is an early sign of deficiency disease. It would be interesting to hear more about this condition, which as far as can be judged from the photographs, has not before been described. Some other, well-recognized, changes in the mouth are also noted. Of vitamin C deficiency it is stated that " Painful induration with swelling of the calf muscles is a common sign of early scurvy, and often appears before any oral manifestations." No mention is made of the typical skin changes in scurvy and it should be recognized that the affection of the gums is no good criterion of lack of ascorbic acid.

Lastly is included a syndrome consisting of a "fluttering" apex beat associated with attacks of recurrent oedema of the lower limbs without albuminuria. Nothing is said as to the possible underlying cause, but possibly it might be akin to so-called cardiac beriberi.

H. S. Stannus.

EARLE (K. Vigors). **Avitaminosis in Apparently Healthy Trinidadians.**—*Brit. Med. Jl.* 1942. Feb. 21. pp. 255–257. [10 refs.]

FASAL (Paul). **A Nutritional Survey of the Federated Malay States. III. Supplementary Food on Estates.**—*Bull. Inst. Med. Res. Federated Malay States.* 1941. No. 1. 16 pp.

Subnutrition is common among Tamil and Malay children and fairly common among adults, particularly women. The chief deficiencies are of protein, fat, vitamin A, calcium and iron. Suggestions for improving the diet of the whole estate population, *e.g.*, communal feeding, propaganda, vegetable allotments and the provision of skilled gardeners, are made, and immediate help for the children advocated. Many estates already provide children with supplementary meals, *e.g.*, Reed's pudding and Millard's mixture. Both of these counteract the vitamin deficiencies; the former also improves growth. New more palatable supplements, cheaper and more nutritious, which will appeal to adults as well as children, are discussed. Soya bean forms an ideal basis. Its composition is compared with that of other foodstuffs. A cake of soya bean, skim milk powder, yellow dhall, rice flour and red palm oil is described which fulfils all the requirements and is equally acceptable to Tamils, Malays and Chinese. Soya bean and skim milk are imported, so indigenous substitutes were considered. Cocoanut or groundnut cake could partially replace soya bean but additional ghee, dhall and rice flour are recommended. Skim milk could be replaced by fish meal and possibly by bone meal. Recipes and the nutritional composition and costs of all the supplements mentioned, are given. The distribution of supplements at infant welfare centres, schools, etc., is urged.

H. N. Green.

RAYMOND (L. D.). **Red Palm Oil.** [Correspondence.]—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1941. Nov. 29. Vol. 35. No. 3. pp. 199–200. [Summary appears also in *Bulletin of Hygiene.*]

The process described results in the production of a cheap and palatable source of vitamin A for use in tropical countries. Nyctalopia was formerly fairly common among prisoners in Tanganyika, whereas since the issue of ½ oz. of palm oil daily this condition has become a rarity. Liking for crude palm oil seems, however, to be an acquired taste, and the flavour, especially if the oil is highly acid, is obnoxious. Nevertheless, especially at the present time, troops require a good and sure supply of vitamin A. The author of this note finds that treatment by steam *in vacuo* for 2–3 hours at 150°C. results in deodorization of the oil. Very little carotene is oxidized during the process. The oil thus treated is mixed with 5 volumes of good quality crude groundnut oil, or sesame oil, or deodorized coconut oil. The mixture is acceptable to African troops; it contains a minimum of 2,000 microgrammes of carotene per ounce, and may contain double that amount.

H. H. S.

EARLE (K. Vigors). **Polyneuritis in Trinidad Oil Workers.**—*Jl. Trop. Med. & Hyg.* 1941. Nov. 15. Vol. 44. No. 22. pp. 150–152. [14 refs.]

"(1) Nervous lesions occurring in malarial and non-malarial patients are described.

"(2) It is suggested that many of the nervous lesions formerly ascribed to malaria are due to either a combination of avitaminosis and malaria or to avitaminosis alone."

FASAL (Paul). **A Nutritional Survey of the Federated Malay States. IV. Food Values of Common Articles of Diet for Malays and Tamils, etc., in Malaya.**—*Bull. Inst. Med. Res. Federated Malay States.* 1941. No. 3. 22 pp. [16 refs.]

BERIBERI.

AYKROYD (W. R.). **The Poor Rice-Eater's Diet.**—*Bull. Health Organisation.* (League of Nations.) 1940/41. Vol. 9. No. 3. pp. 342–356. [Summary appears also in *Bulletin of Hygiene.*]

Dietary surveys of rice-eating groups have been made in sample areas. The foodstuff composition of the diets is similar throughout India, consisting of little other than rice. Almost every important constituent falls below the accepted standards, Ca in particular, for the average daily intake averages 0·2 gm. To these people a rice of high nutritive value is vital. The question of how far, and why the preference for milled rice has spread in India, is being investigated in Madras. About 70 per cent. of the rice eaten is milled; home-pounding is only carried on in rural areas, and even here the mill is penetrating. Better transport makes it easy to bring rice to the mill, which will pound in minutes what would take as many hours by hand. The cost is negligible—often the rice is milled in return for the husk and bran. Smallholders often find it easier to sell their harvest and buy imported rice. "Paddy" cannot be bought in small quantities, so that the poor cannot afford to pound their own rice. Efforts have been made to commercialize hand-pounded rice but this is inevitably dearer than milled rice. There is reason to believe that the poor would not object to pounded rice, if it were cheap. Pounded rice deteriorates more rapidly than milled, but since stocks are quickly consumed in South India, this is not a grave obstacle. Though there may be some use in refusing to licence new mills in areas where rice is still pounded, it is hopeless to try to revive hand-pounding where the mill is established. A better solution is to produce undermilled rice and to educate people to its use. Excessive washing destroys 25 per cent. of the vitamin B_1 content of rice, but this is a difficult custom to alter. Rats fed on a diet comparable with the poor rice-eater's showed very slow growth. The effect of various supplements on the growth rate was studied. Milk produced striking results; Ca salts were almost as effective. Dried yeast, meat and eggs were of value but soya bean, other pulses and pure protein had little effect. Parallel experiments on children corroborated these results. Milk is scarce

but a Ca salt could be supplied cheaply. Brief mention is made of other deficiencies in these diets, notably in vitamin A, and in nicotinic acid and other factors of the vitamin B_2 complex. It should not be difficult to increase the production of leafy vegetables and fruits, and red palm oil could be popularized. A preparation of Ca salts, iron and nicotinic acid might be distributed to children when natural foodstuffs are insufficient. *H. N. Green.*

VAN VEEN (A. G.). **The Rice Problem.**—*Bull. Health Organisation.* (League of Nations.) 1940/41. Vol. 9. No. 3. pp. 357–360. [Summary appears also in *Bulletin of Hygiene.*]

The effects of different degrees of milling, of washing, steaming, and of the combination of these processes on the vitamin B_1 content of rice, are tabulated. Milling causes the greatest loss—the B_1 contents of 500 gm. of husked, undermilled, and polished rices were 400–500, 250–400, and 100–200 I.U. respectively. Washing caused further loss, but steaming had little effect. Although other valuable substances are lost in milling and washing, the rice problem is chiefly the beriberi problem. The problem is complicated by the fact that husked rice will not keep. Steamed rice keeps well but is bulky and expensive to transport and must be milled before use, so that most people dependent on imported rice have no choice. If the polished rice diet includes maize or large quantities of legumes, or meat or fresh fish, the vitamin B_1 supply may be adequate. In the Netherlands Indies beriberi occurs when the maize crop or fishing has been poor. An attempt was made to provide vitamin supplements in Java. Salt was the only suitable vehicle available. This product proved unstable under tropical conditions, and too expensive to be of practical use. Even in districts where husked rice is available, there is a tendency to eat more milled rice as it looks more attractive and denotes prosperity. As the rice problem differs from place to place, it is recommended that the regulation of price, the ruling as to the number of mills, and the degree of milling appropriate to certain seasons and different districts should be left to the initiative of the Government. *H. N. Green.*

AYKROYD (W. R.) & KRISHNAN (B. G.). **Rice Diets and Beriberi.**—*Indian Jl. Med. Res.* 1941. July. Vol. 29. No. 3. pp. 551–555.

In 1940 in a special research memoir Aykroyd and his fellow-workers discussed the relation between rice consumption and beriberi [*Bull. of Hyg.*, 1940, Vol. 15, p. 505]. In the present article the results of a diet survey carried out in Alamaru, Godavari Delta, are considered. Beriberi is common in the district, particularly in August–October; figures are given for a number of years showing 80, 61, and 68 in these months respectively, as compared with 18 in January.

The authors made two surveys, one in January and another in September. Both raw and parboiled rice are consumed; the average intake in ounces per consumption unit daily is given as: in January, raw rice 9·4, parboiled 12·1; in September 20·5 and 1·4 respectively.

"Rice immediately after harvesting is not considered very suitable for consumption if husked and subsequently pounded or milled in the *raw* state. It cooks to a pasty consistency and is said to be difficult to digest. If stored in the husk for 2 months or thereabouts it becomes more acceptable in the raw state. Parboiling, on the other hand, renders freshly harvested rice immediately suitable for consumption. At the time of the

harvest in November and December stocks of rice may be low and the new crop required for use immediately by the poorer villagers. Accordingly they use parboiled rice for a month or so. When the paddy has matured they return to raw rice, which they prefer."

In the Godavari Delta machine-milled grain is consumed mostly, whether it is parboiled or raw. COWGILL in 1934 and WILLIAMS and SPIES in 1938 showed that when the vitamin B_1/calorie ratio falls below 0·25 the risk of beriberi is great. If this be estimated on the findings of the present study the first survey gives 0·28, the second 0·20, in other words the latter is below the "danger point."

H. H. S.

MEYERS (F. M.). **Possible Adaptation to a Low Vitamin B_1 Intake.**—*Amer. Jl. Med. Sci.* 1941. June. Vol. 201. No. 6. pp. 785–789. [15 refs.] [Summary appears also in *Bulletin of Hygiene.*]

Although beriberi is common in some parts of the Netherlands East Indies, sub-clinical vitamin B_1 deficiency is not. A standard diet containing 1·5 to 2 mgm. of thiamin was given to 15 healthy Javanese men and the daily urinary output estimated for one to three days. They were then given subcutaneous doses of 2 to 4 mgm. of thiamin daily for two or three days. As controls, three Chinese with mild beriberi, and three healthy Javanese, who were given a diet rich in vitamin B_1 for a preparatory period of 5 to 17 days were tested similarly. In the healthy persons the thiamin output varied from 0–63 μgm. daily. The percentages of the test doses excreted ranged from 10 to 50 but chiefly from 10 to 30 and there was no significant difference between the healthy control and test groups. Although the normal thiamin excretion was much lower in all persons than that found in temperate regions, the proportion of the test doses excreted was similar to that found in Europe and the U.S.A. The author has found that in sub-clinical vitamin B_1 deficiency, adrenalin produces a greater rise in blood pressure after a patient has been treated with thiamin. The test was positive in the three beriberi cases and in three of the experimental group, but in none of the three prepared control persons. No correlation was found between the thiamin output and the results of the test, and it is concluded that a low thiamin output, though indicating a low vitamin B_1 level in the body, does not necessarily indicate that a deficiency state exists. In spite of the fact that the diet of this population is probably very low in vitamin B_1, consisting of a large proportion of unpolished rice, only a small proportion develop clinical symptoms of vitamin B_1 deficiency. A long-continued low vitamin B_1 intake probably results in an adaptation of the body.

H. N. Green.

AYKROYD (W. R.) & KRISHNAN (B. G.). **Infantile Mortality in the Beriberi Area of the Madras Presidency.**—*Indian Jl. Med. Res.* 1941. Oct. Vol. 29. No. 4. pp. 703–708. With 1 chart.

Infant beriberi has not been reported in India, but, judging by analogy of Japan where in 1928–32 one-third of those dying from beriberi were infants under one year, and of Manila where they constituted practically one-half, it is probable that the disease is common in infants in beriberi areas.

The authors have studied this question in the Northern Circars district of the Madras Presidency. The symptoms in the more acute forms of infant beriberi are thus described :—

" The infant is suddenly seized with what appear to be severe paroxysms of pain ; during a paroxysm it may straighten out its body and become quite rigid. Between attacks, the muscles feel abnormally soft and flabby. Vomiting is frequent. There is usually cyanosis and coldness of the extremities and difficulty in breathing is obvious. Right-sided dilatation of the heart is common and the pulse is weak and rapid. Excretion of urine is diminished. General oedema is rare but localized oedema may be observed. A husky or almost inaudible voice, due to oedema of the larynx and not to paralysis of the vocal cords, is very characteristic of infantile beriberi. The knee-jerks may be absent. Death often occurs within 24 hours unless the appropriate treatment is given."

Now, at St. Joseph's Hospital, Guntur, it had been noticed that breast-fed infants presenting some such clinical picture and acutely ill could be relieved rapidly by injection of pure vitamin B_1, and examination of the mother would yield evidence of beriberi—numbness, tingling, slight paresis.

Again, in beriberi areas infants at the age of 3–4 months are most commonly attacked and infant mortality is higher in the 1–6 month period than in the first four weeks of the 6–12 month period. The following table compares the rates in 17 towns in the beriberi area with an equal number outside that area and brings out this point.

Infantile mortality in 34 towns (1935–39).

	Reported average infant mortality rate.	0–1 month. Percent. of total infant mortality.	1–6 months. Percent. of total infant mortality.	6–12 months. Percent. of total infant mortality.
17 towns in beriberi area ...	203	34·2	41·8	24·0
17 towns outside beriberi area...	164	52·7	26·9	20·4

In Burma the infant mortality in 1926 was 23·5 under one month, 58·0 in those from 1 to 6 months and 18·5 in the 6–12 month period, but—and this is the important point—the peak was in the 1–2 month period and not at the 4th month, and the high rate is ascribed to wrong feeding of infants, giving them solid food after the first month. This and the evidence given above is held to *suggest*, though of course it does not *prove*, that beriberi is a cause and an important cause of infant mortality in the Northern Circars district of the Presidency.

H. H. S.

EARLE (K. Vigors). **Notes on Infantile Beri-Beri in Nauru.**—*Jl. Trop. Med. & Hyg.* 1941. Nov. 1. Vol. 44. No. 21. pp. 142–144.

The symptoms of infantile beriberi as seen in Nauru at the present day differ considerably from those recorded in BRAY's original description in 1928 [this *Bulletin*, 1928, Vol. 25, p. 869] ; this is probably ascribable to the changed diet and habits of the present-day Nauruans as compared with those of thirteen years ago. On clinical grounds the

author divides cases into acute, chronic, diarrhoeic and insidious [which, of course, is not a classification]. He himself states that the acute may arise from the chronic ; the diarrhoeic form is an " acute " disease and may also intervene in the chronic, while the " insidious " comprises a mingling of symptoms due to other avitaminosis as well as B_1.

The chronic form should, states Dr. Earle, be better named " pre-beriberi " as the fat and flabby and flatulent infant with enlarged liver and apathetic when examined may at any time become an acute case, with symptoms of gastro-enteritis (vomiting, colic, abdominal tenderness and slight rise of temperature) or respiratory affection of a capillary bronchitic type (dyspnoea, cyanosis, dullness on percussion, râles and bronchial breathing) or meningismic with retraction of head, twitching, rolling of eyes, dilated pupils, drowsiness to coma.

The diarrhoeic form rapidly brings the child to a state resembling marasmus, with sunken fontanelles, wizened features, rhagades, and perhaps thrush.

Treatment is on the usual lines of administration of vitamins. " Toddy " which used to be a favourite remedy and most effectual in the fermented form is not allowed, by law, to be made, and the unfermented contains no vitamins. The author observed good results to follow the use of a sulphonamide drug, but whether this does more than benefit secondary infection needs further study and comparison with control cases. *H. H. S.*

FEHILY (Lydia). **Does Infantile Beriberi occur in Infants who have never been Breast-fed ?**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1941. Nov. 29. Vol. 35. No. 3. pp. 177–182. [16 refs.]

According to the author, under the term " Infantile Beriberi " two distinct conditions have been (and are) included. One an intoxication occurring in breast-fed infants, of which the symptoms are vomiting, restlessness, abdominal pain, cyanosis, dyspnoea and running pulse ; the other a true avitaminosis with such symptoms as anorexia, retarded growth, loss of weight, anaemia, inanition, oedema, aphonia, meteorism and constipation. The former usually appears in the first 100 days of life of the breast-fed child, and only in the breast-fed, whereas the latter occurs in older children who have been " brought up by hand " or breast-fed, entirely or in part. The latter (avitaminosis) may exist without the former and the former without the latter, or the former may pass, even suddenly, into the latter.

More must be said about the intoxication form. In the milk of women (who may themselves be suffering from deficiency of vitamin B) is a substance, methyl glyoxal, an intermediate metabolic product of carbohydrates, which is toxic. When an infant ingests this it tries to get rid of this and other intermediate products, partly by excretion, partly by further oxidation of them by means of vitamin B as co-carboxylase. The infant's reserve of this is soon used up, the toxic products accumulate and, especially the methyl glyoxal, cause the symptoms of " breast milk intoxication," as described above. Such children may make satisfactory progress until these toxic products occur in the milk, when transition to the avitaminotic state may rapidly take place. On the other hand, infants who have been fed artificially since birth are ill-nourished before manifestations of avitaminosis B declare themselves and the transition to a beriberic state is gradual and

insidious and they, in many cases, succumb to intercurrent disease, commonly bronchopneumonia, before symptoms of the adult type of beriberi appear.

[The abstracter of this article has tried to do justice to the author and to express a complicated problem in as simple a way as possible, according to his conception of the author's thesis. The whole, however, is not easy to grasp and is somewhat complicated by the author's classification of several conditions under the term Infantile Beriberi: Initial I.B., which by the author's diagram may pass on to Subacute I.B., or to Acute or Chronic I.B., while either of the last two may be a sequela of the first. Having made the distinction between "breast-milk intoxication" and B-avitaminosis, and stressed it, the author appears to throw over the whole position in her summary by calling both conditions Infantile Beriberi.] *H. H. S.*

SUNDARARAJAN (A. R.). **The Vitamin B_1 Content of Human Milk.**—*Indian Jl. Med. Res.* 1941. July. Vol. 29. No. 3. pp. 567–573. [13 refs.]

The author has examined human milk of subjects without signs of beriberi for its content in vitamin B_1, flavin, calcium, ether extractives, lactose and protein and for vitamin B_1 and riboflavin in cases of maternal and infant beriberi. For details of analytical methods the original must be consulted. The author presents his findings in two tables and sums them up as follows:—

"1. The vitamin B_1 content of 44 samples of human milk has been determined by the thiochrome method. In this series neither mothers nor infants showed evidence of beriberi. The average vitamin B_1 content was 16·3μ g. per 100 ml. when the infant was under 4 months and 19·5μ g. when it was over this age.

"2. In cases in which beriberi was present in the mother and in some instances in the child an average value of 16·0μ g. per 100 ml. was observed. It is suggested that a toxic factor, the product of deranged carbohydrate metabolism resulting from vitamin B_1 deficiency in the mother, may be the precipitating cause of infantile beriberi."

This is of particular interest in connexion with the work by Dr. FEHILY (above). *H. H. S.*

LAWS (Clarence L.). **Sensitization to Thiamine Hydrochloride.**—*Jl. Amer. Med. Assoc.* 1941. July 19. Vol. 117. No. 3. p. 176.

The patient was given thiamin hydrochloride subcutaneously, at first each day, but later at weekly intervals, during several months. She then allowed 10 days to elapse, and half an hour after receiving the next injection suffered from an attack of urticaria with oedema of the face, which responded to adrenalin. Intradermal injection of thiamin proved this to be the sensitizing agent, and it is noted that she was not sensitive at the beginning of the treatment. It is therefore suggested that intradermal tests should be made in patients who have previously received thiamin injections, before commencing another course. *C. W.*

MASON (Harold L.) & WILLIAMS (Ray D.). **The Effect of Ingestion of Nicotinic Acid on the Determination of Thiamine in Urine by the Thiochrome Method.**—*Jl. Biol. Chem.* 1941. Aug. Vol. 140. No. 2. pp. 417–422.

ROBERTSON (R. Cecil), BARD (Solomon) & CHEN (John). **The Post Mortem Appearances in Acute Cardiac Beri-Beri (Preliminary Communication).**—*Caduceus.* 1941. Aug. Vol. 20. No. 3. pp. 162–170. [21 refs.]

FEHILY (Lydia). **Chinese Superstitions and Prejudices in Relation to Beriberi.**—*Jl. Philippine Med. Assoc.* 1941. Feb. Vol. 21. No. 2. pp. 87–90.

FEHILY (Lydia). **The Prevention of Beri-Beri.**—*Chinese Med. Jl.* 1941. July. Vol. 60. No. 1. pp. 53–65. [17 refs.]

PELLAGRA AND ALLIED CONDITIONS.

BEAMS (Argyl J.), FREE (Alfred H.) & GLENN (Paul M.). **The Absorption of Galactose from the Gastro-Intestinal Tract in Deficiency Diseases.**—*Amer. Jl. Digestive Diseases.* 1941. Nov. Vol. 8. No. 11. pp. 415–421. With 2 figs. [17 refs.]

Absorption from the intestinal tract may be impaired because of anatomical, chemical or physiological changes which may be responsible for a deficiency state—or again, defective absorption may be produced by this same state. At present most of this evidence is indirectly derived from clinical observations. Thus, for example, carcinoma, intestinal anastomoses, partial stenosis and ulcerative colitis have been found to evoke the pellagra syndrome; moreover pernicious anaemia may develop under similar circumstances. Those instances of this latter disease which respond solely to parenteral liver administration may possibly come under the same category.

Some simple clinical test for detecting such faulty absorption is needed, but when the complexities of the absorptive mechanism and the numerous factors involved are considered, the difficulties in devising such a test are many. The flat glucose tolerance curve obtained in coeliac disease and allied states is well-established. The galactose absorption test seems to hold out the best possibilities, because the absorption of galactose, like that of many foods, is not a simple process of diffusion, but involves the specific chemical mechanism which VERZÁR has ascribed to phosphorylation, as galactose does not normally occur in the fasting blood, but after oral ingestion is absorbed in the small intestine, passing into the portal blood, being converted in the liver to glycogen. When present in the blood it is excreted by the kidneys and, contrasted with glucose, there does not appear to be any threshold concentration below which excretion does not take place.

The method of blood galactose determination depends upon its estimation as non-fermentable reducing substance. The difference between this latter in fasting blood and that after ingestion of galactose is used as a measure of this carbohydrate. By use of a special galactose-fermenting yeast it is possible to identify as galactose the increase in the non-fermentable reducing fraction of blood following galactose ingestion. As the result of preliminary studies 0·6 gm. of galactose per kgm. body weight was employed and this quantity gives adequate blood galactose level in normal subjects and provides a range of concentration which enables rapid and decreased absorption to be detected.

In radiographic studies on patients in this series increased motility was observed in one patient only. Two with pellagra and all with non-tropical sprue showed changes in the small intestine characteristic of deficiency disease, such as disturbances of the mucosal pattern with variations in size and contour of the lumen, but none was observed in cases of pernicious anaemia or ariboflavinosis.

All patients with active pellagra showed evidence of impaired absorption and gave positive evidence that this constitutes one of the physiological disorders of this disease. There is evidence too that response to therapy is accompanied by increased absorption. All sprue patients gave evidence of impaired intestinal absorption.

Improvement of absorption accompanied clinical improvement in pellagra, but not in sprue (in fact the form we recognize as idiopathic steatorrhoea). Two out of four cases of rosacea keratitis responding to riboflavin therapy gave indications of decreased absorption which improved after the disappearance of the keratitis; but approximately one-half of the patients with pernicious anaemia showed impaired absorption, which did not run parallel with changes in the blood condition, suggesting a secondary factor involved in absorptive changes. *P. Manson-Bahr.*

DEENY (James). **Pellagra in General Practice in Northern Ireland.**—*Brit. Med. Jl.* 1942. Jan. 31. pp. 157–158.

Reports from the whole of Ireland show only 4 cases of pellagra in the period 1935–39, but the author describes, in this paper, 16 which have come under his own care in Northern Ireland, giving details of each. In the majority cure was effected by nicotinic acid [but the results might have been still better had riboflavin been added]. It seems, therefore, that pellagra is relatively common, but is not usually recognized, and that it is usually diagnosed as neurasthenia, dyspepsia or eczema. The diets of the patients are stated to have been inadequate or unbalanced. *C. W.*

MINNICH (Virginia), WRIGHT (Sydney T.), MOORE (Carl V.) & SPIES (Tom D.). **Whole Blood and Plasma Ascorbic Acid Concentrations in Patients with Pellagra and Associated Deficiency Diseases.**—*Proc. Soc. Experim. Biol. & Med.* 1940. Oct. Vol. 45. No. 1. pp. 441–446. With 1 fig. [10 refs.]

A study of 70 patients attending the Nutrition Clinic, Hillman Hospital, Birmingham, Alabama, and 20 controls.

Nearly all the patients had already suffered from pellagra, beriberi or other deficiency condition. Their diet was generally lacking in vitamin C during the greater part of the year.

The ascorbic acid content of whole blood or cells was determined by the methods of BUTLER and CUSHMAN (1940), and MINDLIN and BUTLER (1938). The content of plasma is unreliable as it changes quickly with change of diet.

For controls the figure obtained was 0·95 to 1·46 mgm. per cent. with an average of 1·20. The average for the patients was 0·63 mgm. per cent. Among the 70 cases only 15 had a content within normal limits; on the other hand only 8 showed advanced depletion, *i.e.* a figure below 0·3 mgm.

There were no significant differences between cases exhibiting symptoms of one or other of the vitamin B syndromes. The general conclusion is that partial depletions of vitamin C are commonly associated with other deficiency states. *H. S. Stannus.*

SWAMINATHAN (M.). **Further Studies on the Cyanogen Bromide Method of estimating Nicotinic Acid in Biological Materials.**—*Indian Jl. Med. Res.* 1941. Apr. Vol. 29. No. 2. pp. 325–340. With 3 figs. [22 refs.]

GIRI (K. V.) & NAGANNA (B.). **An Adsorption Method for the Estimation of Nicotinic Acid Content of Animal Tissues and Blood.**—*Indian Jl. Med. Res.* 1941. July. Vol. 29. No. 3. pp. 585–590.

MEULENGRACHT (E.) & BICHEL (Jørgen). Riboflavin-Avitaminose und das Plummer-Vinson-Syndrom. [**Riboflavin Deficiency and the Plummer-Vinson Syndrome.**]—*Klin. Woch.* 1941. Aug. 16. Vol. 20. No. 33. pp. 831–834. [11 refs.]

These authors surmised that in the ariboflavinosis symptom-complex they could detect resemblances to the Plummer-Vinson syndrome.

This syndrome of dysphagia and anaemia was originally described by PLUMMER in 1914 and VINSON in 1922. The outstanding subjective symptom is dysphagia, described as a "lump in the throat" or "constriction of the neck." Objectively there is a tendency to indolent fissuring at the angles of the mouth, atrophy of the oral and hypopharyngeal mucosa, an apparently narrowed mouth aperture, easy loss of teeth and papillary atrophy of the tongue. By barium swallow there is found retention in the recessus pyriformis and there certainly exists a tendency to cancer.

This disposition exists in middle-aged women with achylia gastrica and is often associated with a hypochromic anaemia. It is therefore accompanied by alteration in the texture of the nails and koilonychia. General symptoms consist of emaciation, debility and fatiguability. Four female patients ranging in ages from 48 to 78 in whom the diagnosis of Plummer-Vinson syndrome had been arrived at on clinical and biochemical grounds were treated with intensive riboflavin therapy—a preparation, Ido B_2, was employed, 4 cc. injected daily by the intramuscular route (1·4 mgm. crystalline riboflavin) for 14 days. It soon became apparent that this substance exerted a favourable effect on the angular fissures of the mouth, which healed in a few days. The rapidity with which this took place seemed to confirm the well-known observations of SEBRELL and BUTLER.

This form of therapy had, however, no effect, as far as could be ascertained, upon the dysphagia; neither were any striking changes observable in the glossitis, emaciation, anaemia or pathological nails.

It is suggested that riboflavin deficiencies are to be especially looked for in subjects with achylia gastrica which favours the supervention of secondary avitaminosis.

Possibly the direct action of riboflavin is concerned with iron metabolism.

[It is to be noted that an actual gastric carcinoma was present in one of these patients and death was due to hepatic metastases.]

P. M.-B.

BICHEL (Jørgen) & MEULENGRACHT (E.). Pellagra, entstanden nach Behandlung des Plummer-Vinson-Syndroms mit Riboflavin. [**Pellagra, Results of the Treatment of the Plummer-Vinson Syndrome with Riboflavin.**]—*Klin. Woch.* 1941. Sept. 6. Vol. 20. No. 36. pp. 913–914.

In an experimental trial of treatment of the Plummer-Vinson syndrome with riboflavin these authors were able to observe the supervention of characteristic pellagrous skin changes shortly after cessation of treatment. This phenomenon, which has never in their experience been previously recorded, appeared to be analogous to the pellagrous manifestations, which may superimpose themselves in patients too energetically treated with vitamin B_1, whether they have exhibited the corresponding signs of this avitaminosis or not. Furthermore, LEHMANN and H. NEILSEN have shown that, on subsequent medication with a polyvalent B-vitamin preparation, the pellagra disappeared. A further example, quoted by SALVESEN, occurred in a woman with osteosclerotic anaemia treated with heroic doses of vitamin B_1, whereupon pellagra made its appearance; also another similar instance after vitamin C therapy.

The patient in question was a woman of 62 treated early in 1940, who after gastroenterostomy for gastric ulcer in 1919 developed the Plummer-Vinson syndrome with glossitis, angular stomatitis, oesophageal stenosis and secondary anaemia. Treatment was instituted with injections of riboflavin, 7 mgm. daily for 42 days. Fourteen days later typical pellagrous pigmentation became visible on the dorsal aspect of both hands, although glossitis and angular stomatitis disappeared after eight riboflavin injections. Pigmentation was also seen on both cheeks, in the nasal and circumoral regions, and paraesthesia of both feet was subsequently noted. All these pellagrous manifestations yielded to a polyvalent vitamin B preparation (Becoplex). It is possible to offer several explanations of this curious sequence. There may have existed a pellagrous diathesis in this case, originating in dietetic restrictions prior to hospitalization, which was in the process of development, or, it may be that vigorous vitamin B_1 therapy so seriously unbalanced the basal metabolism as to bring about the pellagrous syndrome. *P. M.-B.*

LEPORE (Michael J.) & GOLDEN (Ross). **A Syndrome due to Deficiency of the Vitamin B Complex.**—*Jl. Amer. Med. Assoc.* 1941. Sept. 13. Vol. 117. No. 11. pp. 918–923. With 5 figs. [Summary appears also in *Bulletin of Hygiene.*]

A diet high in carbohydrate and deficient in the vitamin B complex, protein, fat and sometimes calories, produces a syndrome which is not classical pellagra, ariboflavinosis, beriberi or sprue. Thirty ambulatory patients were studied. The main clinical features were weight loss, asthenia, anorexia, irritability, and personality changes, weakness and faintness 2–4 hours after meals, constipation or diarrhoea and a highly irritable gastro-intestinal tract. A flat oval dextrose curve was common. The small intestine showed X-ray changes ranging from motility disturbances and abnormal mucosal pattern to mucosal atrophy. Sedation and psychotherapy were without effect but the condition responded to treatment with the whole vitamin B complex. Oral therapy was occasionally unsuccessful; this may be related to the

fact that many patients showed achlorhydria or hypochlorhydria, for there is evidence that vitamin B_1 is protected by the gastric acidity. Capillary fragility was common and responded to therapy with a yeast syrup. Steatorrhoea was absent. Patients with severe small intestine changes responded best to parenteral administration of the B complex or crude liver extract. In oral therapy better results were obtained with the yeast syrup than with capsules containing concentrated B complex. Early treatment is important, otherwise changes in the small intestine may become irreversible. *H. N. Green.*

KUO (P. T.) & HUANG (M. S.). **Nutritional Stomato-Glossitis among the War Refugees in Shanghai.**—*Chinese Med. Jl.* 1941. May. Vol. 59. No. 5. pp. 430–440. With 6 figs. on 2 plates. [20 refs.] [Summary appears also in *Bulletin of Hygiene.*]

Owing to the inadequate diet (consisting almost wholly of plain rice or congee) of the refugees for the last 2 years, stomato-glossitis, which was rare in China, is now common. In 6 months, 237 cases were seen in one hospital, and detailed accounts of 18 severe cases are given. Six types of glossitis were observed—marginal inflammation, indentations of the tongue, generalized inflammation, partial atrophy, total atrophy, and pellagrous stomatitis. Of these 18 patients, 15 had acute or chronic beriberi, 10 had nutritional oedema with low serum proteins, two had the ophthalmic and cutaneous lesions of vitamin A deficiency, and one possibly had avitaminosis C. A diet containing beef, pork, eggs, green vegetables, liver, beans and bean curd was given, but owing to the extremely poor appetites of most of the subjects no improvement occurred until vitamin preparations were given parenterally. The fiery colour which distinguished the pellagrous tongue disappeared within 48 hours of the administration of nicotinic acid, but the atrophic condition which remained disappeared only when the other deficiencies in the vitamin B complex were rectified. An account is given of the clinical course, the quantitative changes in the blood haemoglobin, reticulocytes, red cells and serum proteins, and of changes in the bone marrow, in 15 cases of atrophic glossitis (usually accompanied by cheilosis) which were treated parenterally with liver extract. Three of these cases were previously treated unsuccessfully with nicotinic acid. The cheilosis did not heal as quickly as the glossitis, but it eventually improved as the appetite of the patient increased. *H. N. Green.*

NICHOLLS (Lucius). **Crazy Pavement Skin Eruption.**—*Trans. Roy. Soc. Trop. Med. & Hyg.* 1940. Nov. 30. Vol. 34. No. 3. pp. 291–292. With 2 figs. on 1 plate.

Dr. Nicholls describes and gives an excellent photographic illustration of two patients showing "crazy pavement" skin, the result of fissuring [see also this *Bulletin*, 1934, Vol. 31, p. 344]. One was a man of 35 years with oedema of the legs and the skin over the anterior surface finely and irregularly fissured. He had suffered from nephritis for two years. The second was a man, 30 years of age, suffering from phthisis. Both legs (but only the legs) showed patches of epithelium darker than normal and separated by fissures. Inquiry did not reveal any marked dietary deficiencies. These cases and others bearing some resemblances to them have been grouped together under

the term "pellagroid," and the author urges that we have no right to do this on such inadequate grounds. "It may be" he states, "that in such cases as these there has been deficient absorption or faulty metabolic utilization of certain vitamins, but in the present state of our knowledge we are not justified in making assumptions of this kind, still less to diagnose all such cases as pellagra mainly on the existence of a crazy pavement eruption"— a conclusion with which most tropical practitioners will agree. *H. H. S.*

RIDDLE (Jackson W.), SPIES (Tom D.) & HUDSON (N. Paul). **A Note on the Interrelationship of Deficiency Diseases and Resistance to Infection.**—*Proc. Soc. Experim. Biol. & Med.* 1940. Oct. Vol. 45. No. 1. pp. 361–364. [12 refs.]

"*Summary and Conclusions.*—1. Our observations in 150 patients from a region of Alabama in which deficiency diseases are endemic show a relationship between these diseases and the resistance to, and presence of, infections with *Staphylococcus aureus* and *Streptococcus hemolyticus*. 2. The lesions at the corners of the mouth, characteristic of riboflavin deficiency, contained pure or nearly pure cultures of hemolytic strains of *Staphylococcus aureus* in 80% of the cases, and in the remaining 20%, *Streptococcus hemolyticus* predominated. Following the oral or intravenous administration of riboflavin or substances rich in it, the fissures healed rapidly and the organisms were no longer demonstrable. 3. When the bacterial flora of the conjunctival sacs were studied in cases of dietary deficiency disease and associated conjunctivitis, hemolytic strains of *Staphylococcus aureus* were found to predominate in 14 of the 30 cases. Smears and cultures demonstrated the presence of *Corynebacterium xerosis* in a pure state in all of the spots of Bitot which occurred in 5 cases. 4. In addition to masses of Vincent's organisms, 64% of the ulcerations of the tongue, gums, or buccal mucosa yielded *Streptococcus hemolyticus*, and the remaining 36% contained hemolytic strains of *Staphylococcus aureus*. Following specific therapy with antipellagric substances, the bacterial flora of these ulcerations, including the Vincent's organisms, promptly disappeared. 5. A low complement titre exists in acutely deficient patients, and in the subclinical and mild cases the titre is slightly subnormal or normal. Following clinical improvement the complement titre increases. 6. In the whole blood of acutely deficient patients there is a distinct depression in the bactericidal power for *Staphylococcus aureus*, whereas only a slight diminution in staphylococcidal power was observed in the blood of subclinical and mild cases of vitamin deficiency."

EPIDEMIC DROPSY.

MUKHERJI (S. P.), LAL (R. B.) & MATHUR (K. B. L.). **Investigations into the Epidemiology of Epidemic Dropsy. Part XII. Isolation of Active Substances from Toxic Oils.**—*Indian Jl. Med. Res.* 1941. Apr. Vol. 29. No. 2. pp. 361–365. With 1 plate.

The authors have followed up their investigations into the aetiology of epidemic dropsy and have produced another paper of great interest. In 1940 [see this *Bulletin*, 1941, Vol. 38, p. 288] they described a

method for isolating a substance which will indicate the amount of argemone oil present in mustard oil, and they suggested that the toxicity of the oil corresponded with its content of this substance. In the present paper they describe a simple process for obtaining this from the oil, in the following words :—

" One hundred c.c. of oil, 25 c.c. to 30 c.c. of absolute alcohol and 25 c.c. to 30 c.c. of saturated solution of caustic potash are vigorously shaken together. To accelerate the process of saponification the mixture is heated to just below 100°C. for half to one hour. It is then allowed to cool. Equal amount of distilled water is added and the emulsion is left undisturbed for a few days. Small shining mica-like crystals soon appear which separate out on further dilution with distilled water and are slowly deposited at the bottom of the vessel. The rate of crystal formation increases if the mixture is kept in the refrigerator.

" To obtain the crystals the emulsion is filtered through a filter-paper. The crystals are repeatedly washed with distilled water to remove the soap. Being soluble in hot alcohol and only partially soluble in cold, they are purified by dissolving in hot alcohol and re-crystallizing by cooling. The substance is then dried in hot air-oven at 50°C. to 60°C. and finally under vacuum at 100°C. until constant weight is maintained."

They go on to describe its physical and chemical properties and its composition from microchemical analysis. Its empirical formula is $C_{19}H_{15}O_4N$. Its biological properties are to form the subject of a later communication. *H. H. S.*

LAL (R. B.), DAS GUPTA (A. C.), AGARWALA (S. P.) & ADAK (B.). **Investigations into the Epidemiology of Epidemic Dropsy. Part XIII. Application of the Biological Test to Modified Argemone Oil and its Derivatives.**—*Indian Jl. Med. Res.* 1941. Oct. Vol. 29. No. 4. pp. 813–838. With 9 charts.

The authors, continuing their experiments on the toxicity to rats of mustard oil or its adulterants, have fed these animals on a basic diet and added different extracts of the oil : the white crystalline substance, the crystalline free base, the residue of argemone oil after abstraction of this base dissolved in pure mustard oil, and argemone oil modified by treatment with light. The number of animals used for each test was small, usually 2 or 3, and never more than 5 in a group, but from the post mortem findings the authors conclude that the white crystalline substance and the crystalline free base (to a less degree) have a poisonous effect when added to the basic diet of rats. Argemone oil after removal of the crystalline free base or exposure to light becomes biologically inactive, but addition of the white crystalline substance restores the toxicity. Controls fed on pure mustard oil showed no poisonous effects. Tables and charts are given showing details of the growth rates and histological findings in all the experiments mentioned in the text. *H. H. S.*

LAL (R. B.), DAS GUPTA (A. C.), MUKHERJI (S. P.) & ADAK (B.). **Investigations into the Epidemiology of Epidemic Dropsy. Part XIV. Feeding Experiments on Human Subjects to test the Toxicity of Some of the Derivatives and Modifications of Argemone Oil.**—*Indian Jl. Med. Res.* 1941. Oct. Vol. 29. No. 4. pp. 839–849.

Three feeding experiments with a small number of volunteers are recorded in this article. The first was to establish whether the

crystalline free base of argemone oil was toxic. The second was to test the toxicity of this base and of the white crystalline substance and of the oil after light-treatment. The volunteers for this test were divided into six groups: I. Received 5 per cent. mixture of light-treated oil of argemone in pure mustard oil. II. The same *plus* crystalline free base equivalent to 5 per cent. argemone oil. III. Received the white crystalline substance in pure mustard oil equivalent to 5 per cent. argemone oil. IV. Five per cent. argemone oil in pure mustard oil, with the crystalline free base removed. V. The same *plus* the free base equivalent to 5 per cent. argemone oil. VI. Positive controls with 5 per cent. argemone oil.

The fifth group was devised to test whether, if the crystalline free base was itself non-toxic, removal of the crystalline free base left a radicle which, itself non-toxic, might re-combine with the base to form a toxic substance.

The third experiment was to feed three volunteers for 23 days with food containing 5 per cent. mixture of argemone oil, after subjection to light treatment, in pure mustard oil to which the white crystalline substance had been added equivalent to 5 per cent. argemone oil. In this time each volunteer consumed 45 ounces of oil.

The control group (VI) of the second experiment proved the part taken by argemone oil in causing epidemic dropsy, but the actual toxic principle is not yet determined. Fractions obtained have not proved toxic, the residue after extraction with HCl is not toxic to man; exposure to light deprives the oil of its toxicity. In the authors' words:

"Although some suspicious signs and symptoms were produced by w.c.s. [white crystalline substance] and c.f.b. [crystalline free base] fractions of argemone oil, they were not sufficiently grave to justify being labelled as epidemic dropsy. In this respect the chemical and the biological tests failed as complete tests of toxicity. Since, however, these purified fractions are not likely to be met with in oil as sold in the market, the practical value of either test does not suffer in any way. Since both the isolated fractions and the residue left after extraction of c.f.b. are non-toxic, the simple inference that may be drawn is that the latter constitutes only a part of the toxic molecule found in argemone oil. Since, however, addition of c.f.b. or w.c.s. to the residue left after the extraction of the former fraction does not result in a toxic product, it may be argued that non-toxicity of the residue or of the fractions is due to modification of the toxic substance rather than to its being split up. While we are not in a position to dispute this possibility, the separation of c.f.b. by a relatively gentle treatment would support the hypothesis of splitting rather than of radical modification, especially when it is remembered that the toxic substance in the oil is able to withstand heating to the high temperatures involved in cooking food. The simple process of mixing the c.f.b. or w.c.s. with the residue may lack the necessary chemical energy to effect re-combination into the original toxic substance or loss of some constituent which might have occurred during the process of isolation of c.f.b. may explain it." *H. H. S.*

Ghosh (Jaharlal) & Roy (Bidhubhusan). **Clinical Aspects of Epidemic Dropsy (Observations on 154 Cases).**—*Calcutta Med. Jl.* 1941. Mar. Vol. 38. No. 3. pp. 115–124. With 1 chart.

This is purely a clinical study of epidemic dropsy and does not bring forward any new observations—it does not profess to do so. The authors have noted carefully the symptoms of this disease and their relative incidence in 154 cases. As regards season, most [but number

not stated] were seen in the third quarter of the year, and in August more were recorded than in any other month. Forty-two occurred in the second decade, 50 in the third ; the youngest patient was three years old ; 72 were males, 82 females. Sixty-four of the patients (41 per cent.) gave a history of previous attacks [but this fact alone does not justify the authors' conclusion that one attack " definitely predisposed to subsequent attacks "]. Several cases might occur in the same family, in one instance as many as five. The incubation period is short ; it " may lie within a week and the minimum may be only three days." By this the authors mean that symptoms appeared within this period of arrival from a place where it was not known to be present. Of the symptoms oedema was the commonest, being seen in 145 ; cutaneous manifestations, from flushing and hyperpigmentation to red spots and sarcoids, were present in 115 (74·7 per cent.) and sarcoids themselves in 44 (28·6 per cent.). More than half, 88, or 51·4 per cent., suffered from diarrhoea. Cardiovascular signs were common ; palpitation was complained of in 111 cases, praecordial pain in 95, dyspnoea in 78 ; gallop rhythm was noted in 36. Haemorrhage was a feature in 43 cases (27·9 per cent.). Twenty had bleeding from the gums, five had haemoptysis, three epistaxis, two bleeding from sarcoids. Others had menorrhagia (15) and fourteen had bleeding from the bowel, some due to haemorrhoids, which, in some cases at least, the authors think are closely associated with epidemic dropsy. *H. H. S.*

RELAPSING FEVER.

STANNUS (Hugh S.) & BENDIT (Maximillian). **Relapsing Fever.**—*Lancet.* 1942. Jan. 24. pp. 103–104.

The case described is that of a Belgian aviator who reached Britain after undergoing imprisonment in Spain and after a journey across that country lasting for about one month. The diagnosis was confirmed by blood examination and the disease came to an end after the third febrile attack ; no treatment was given. In the discussion it is pointed out that the disease was, on the whole, mild and resembled the tick-borne form seen in Spain and transmitted by *Ornithodorus marocanus* or *O. exoticus*, rather than the severe louse-borne form. The patient had been infested with lice in Spain and had no recollection of any tick bite, but the authors think it probable that this was a case of tick-borne rather than louse-borne disease. *C. W.*

ANDERSON (Ch.), BERGE (Ch.), FAUCONNIER (H.) & RUNACHER (A.). Etude d'un foyer de fièvre récurrente hispano-africaine dans la région de Bizerte-Ferryville-Mateur. [**The Study of a Centre of Spanish-African Relapsing Fever in the Neighbourhood of Bizerta-Ferryville-Mateur.**]—*Arch. Inst. Pasteur de Tunis.* 1941. June. Vol. 30. No. 1–2. pp. 118–128. With 1 map. [33 refs.]

During the routine examination of slides from febrile cases during the last two months, the authors came across five cases showing relapsing fever spirochaetes. All five patients came from the neighbourhood of Bizerta to Mateur. It is of interest that since 1933 no case of the disease had been reported from this district.

Clinical details are given of these five cases, from four of which spirochaetes were isolated and studied in laboratory animals. None of the patients was infected with lice and since an examination of burrows in the district resulted in the discovery of *Ornithodorus erraticus*, it is to be presumed that this tick was responsible for the outbreak.

A study of the four strains showed that rats were only slightly susceptible, whilst, on the contrary, guineapigs were highly susceptible, recalling the effects of *Spirochaeta hispanica*. Cross immunity experiments against both *S. duttoni* and a Tunisian strain of *S. hispanica* gave negative results, and each of the two local strains which were tested failed to vaccinate against the other. These results confirm previous experience as to the extreme specificity of these strains when studied by cross immunity tests. *E. Hindle.*

ORDMAN (David). **The Occurrence of Relapsing Fever and the Geographical Distribution of *Ornithodorus moubata* in South Africa. With an Account of Investigations carried out in the Northern and Eastern Transvaal.**—*South African Med. Jl.* 1941. Oct. 11. Vol. 15. No. 19. pp. 383–388. With 1 map.

An account of the distribution of tick relapsing fever and *Ornithodorus moubata* in the Union of South Africa.

This disease was first reported from South Africa by Park Ross in 1912, who saw cases in Zululand, and then there are no further published records until 1932, since when numerous cases have been recorded. *Ornithodorus moubata* is widely distributed in the Northern Transvaal and cases of relapsing fever occur frequently among the natives. The tick is also present in the Eastern and Western Transvaal but only occasional cases of relapsing fever have been reported from these districts. Some of these cases have probably not been locally infected, but were imported infections from endemic territories outside the Union of South Africa. In this connexion, the author mentions that in Nyasaland the Angoni take a supply of ticks with them when they are likely to be away from home for a long period, since these natives believe that immunity can only be maintained if they are bitten from time to time by ticks. This practice may explain the ubiquity of these ticks in Nyasaland and also may well lead to the infestation of mine compounds employing Angoni workers. It is recommended that in the erection of compounds for the housing of native labourers, special measures should be taken to prevent the possibility of tick infestation.

The distribution of *O. moubata*, shown on a map, is largely in the northern and eastern parts of the Union of South Africa, adjoining Bechuanaland, Southern Rhodesia and Portuguese East Africa. Although relapsing fever is at present not of major importance in South Africa, the possibility of further outbreaks especially among aggregations of natives in mines and works cannot be overlooked. [See also this *Bulletin*, 1940, Vol. 37, pp. 198, 638.] *E. H.*

DAVIS (Gordon E.). *Ornithodoros turicata* **and Relapsing Fever Spirochetes in New Mexico.**—*Public Health Rep.* 1941. Nov. 21. Vol. 56. No. 47. pp. 2258–2261. With 1 fig.

A rapid tick survey of 10 counties in southern and south-eastern New Mexico, resulted in the collection of 604 *Ornithodorus turicata*

belonging to 41 lots. The ticks were collected from "borrow pits" at the sides of the road, occupied by cotton-tail rabbits, other rodents and birds; also from kangaroo rat mounds, and three from a prairie dog burrow, and three beneath a rock. A total of 539 ticks arrived alive at the laboratory and these were tested for spirochaetes. Eight lots, representing Roosevelt, Chaves, Lea and Hidalgo Counties, were found to harbour relapsing fever spirochaetes. In addition, relapsing fever was contracted by a boy from California staying at a cattle ranch in Chaves County in 1936, which seems to be the first record of the disease in New Mexico. *E. H.*

DAVIS (Gordon E.). *Ornithodoros parkeri* **and Relapsing Fever Spirochetes in Utah.**—*Public Health Rep.* 1941. Dec. 26. Vol. 56. No. 52. pp. 2464–2468. With 1 fig.

This is a note to report the finding of spirochaetes of relapsing fever in *O. parkeri* found in the Uintah, Carbon, Emery and Grand Counties of Utah. Previously, two cases of human relapsing fever had been reported from Utah. Most of the ticks were collected from the burrows of prairie dogs, but it is known that they inhabit the burrows of ground squirrels and burrowing owls also. *C. W.*

FELDT (Adolf). Die Chemotherapie der Recurrensinfektion mit Gold- und Sulfonamidverbindungen. [**The Chemotherapy of Relapsing Fever with Gold and Sulphonamide Compounds.**]—*Klin. Woch.* 1941. Sept. 20. Vol. 20. No. 38. pp. 945–949. With 1 fig. [50 refs.]

The author has made comparative studies of the effects of gold compounds, especially gold keratinate, and sulphonamide derivatives, using mice infected with various strains of relapsing fever spirochaetes including:—*S. recurrentis, hispanica, usbekistanica, novyi,* and three strains of *duttoni.*

The results of treatment with arsenobenzol, the earlier gold preparations Solganal and Neo-solganal, and gold keratinate, are given in tabular form showing the doses for curing acute infections, the prevention of relapses, and residual brain infections, respectively. Gold keratinate has a therapeutic index of 1 : 100 to 1 : 250 for the acute infection, prevents blood relapses with doses having an index of 1 : 8 to 1 : 20, and produces complete sterilization in doses of 1 : 6 to 1 : 15. The respective doses for ordinary Solganal are nearly 15 times as much, and with arsenobenzol it is not possible to prevent relapses and brain infections.

Gold and arsenic compounds are found to be most effective if administered near the crisis of the infection. Large toxic doses are not so good as smaller amounts, which can be well borne.

Large doses of sulphapyridine and sulphathiazole, administered either orally or subcutaneously, cause the disappearance of spirochaetes from the blood of mice infected with relapsing fever, but the animals are not sterilized. The action of these compounds on streptococci and pneumococci in mice is completely neutralized by p-amino-benzoic acid, but with relapsing fever infections this acid increases the effect of the compounds.

The effect of Neo-solganal on streptococci, pneumococci and relapsing fever spirochaetes is not affected by p-amino-benzoic acid.

Neosolganal and sulphonamide compounds show considerable overlapping in their therapeutic action on relapsing fever and coccal infections, and the author recommends that combinations of these two series of compounds should be used in the treatment of bacterial and also virus infections.

In an appendix details are given of the results of treating three paralytic patients, infected with *S. hispanica*, by intravenous injections of 1 gm. neo-solganal in T.C. 6 (a solution of calcium thiosulphate). In each case the fever disappeared within 3 to 8 hours. *E. H.*

RAT-BITE FEVER.

BRAZZAVILLE [AFRIQUE FRANÇAISE LIBRE]: RAPPORT SUR LE FONCTIONNEMENT TECHNIQUE DE L'INSTITUT PASTEUR EN 1940 [CECCALDI (Jean), Director]. pp. 30–44.—**Sodoku.**

An account of a typical case of rat-bite fever, at Brazzaville, the first to be recorded from French Equatorial Africa.

Two guineapigs and two mice were inoculated intraperitoneally with blood from the patient four weeks after he had been bitten by a rat, and *Spirillum minus* appeared in the blood of both mice and a guineapig. Its pathogenicity was also tested in rabbits, monkeys (*Cercopithecus neglectus brazziformis*) fowls, a dog and a cat. The particular susceptibility of the first three suggests that the strain isolated possessed a high virulence.

Attempts to culture the organism were unsuccessful. When inoculated into guineapigs simultaneously with *Trypanosoma gambiense*, the appearance of trypanosomes in the blood was delayed, suggesting an antagonistic action between the two infections.

E. Hindle.

SAVOOR (S. R.) & LEWTHWAITE (R.). **The Weil-Felix Reaction in Experimental Rat-Bite Fever.**—*Brit. Jl. Experim. Path.* 1941. Oct. Vol. 22. No. 5. pp. 274–292. With 3 figs. [15 refs.]

The authors find that the sera of rabbits infected with uncontaminated strains of *Spirillum minus* (rat-bite fever) develop agglutinins for the *OXK* strain of *Proteus* in much higher titre than after infection with *Rickettsia tsutsugamushi*.

The suspicion that strains of rat-bite fever might give a Weil-Felix reaction of the *OXK* type arose from the study of two murine strains of typhus-like fevers contaminated with *S. minus*, and another strain supposed to be typhus but which proved to be only this spirillum. Later a study of three human and two murine strains of rat-bite fever, from which any possibility of a contaminating typhus-like infection of *Proteus* could be definitely excluded, confirmed these results. Three of these strains were carefully studied for evidence of contamination with *Proteus* bacilli but none was found; moreover, the inoculation of normal guineapigs with *Proteus OXK* bacilli was not followed by infection or bacteriaemia. These facts show that contamination with *Proteus OXK* bacilli could not be a source of the high *OXK* agglutinins

in rabbits inoculated with strains of *S. minus* from guineapigs. None of the five strains showed any sign of infection with tsutsugamushi virus.

The high proportion of reacting rabbits (37 out of 38) tested from all 5 strains is further evidence in support of the view that the *OXK* type agglutination is entirely due to the *Spirillum minus* infection.

Three men suffering from tabes dorsalis, and four Macacus monkeys were infected experimentally with *S. minus*. The Weil-Felix reaction was entirely negative in two of the men and two of the monkeys, and the slight rise in titre in the others could not be regarded as a clear positive.

A comparison of the Weil-Felix titres given by sera from groups of rabbits infected respectively with *Proteus OXK* bacilli, *S. minus* and tsutsugamushi virus, show that the titres from the first group are high, those from tsutsugamushi low, whilst those from the rat-bite fever group are intermediate.

The authors are of the opinion that the *OXK* antigen, no less than the spirillicidal antigen, is an integral part of the antigenic mosaic, and that these two components may have a different disposition in depth. High titre sera from rabbits immunized against cultures of *Proteus OXK* and *HXK* gave consistently negative immobilization tests ; moreover, when the *OXK* type agglutinins in sera from rabbits infected with a rat-bite fever strain were absorbed by *Proteus OXK* organisms, the titre of immobilizing bodies remained the same. Since these are the spirillicidal bodies, and therefore the specific antibodies, the *OXK* agglutinins of rat-bite fever sera must be regarded as minor or " group " antibodies.

It is evident that there is an *OXK* component in *Spirillum minus*, unconnected with *Rickettsia* in general and *R. tsutsugamushi* in particular. It is suggested that the common antigenic factor is a polysaccharide, as has been shown to exist by CASTANEDA in the case of *Proteus OX19* and in the Rickettsia of murine typhus.

It is of interest that FELIX (1933) found agglutinins of relatively high titres for one or the other *X* type in the sera of normal tame rats and it seems justifiable to assume that these agglutinations may have been due to infection of the rats with *S. minus*. *E. H.*

LEPTOSPIROSIS.

LAHIRI (M. N.). **A Note on the Occurrence of Leptospirosis in Bombay.** —*Indian Med. Gaz.* 1941. Nov. Vol. 76. No. 11. pp. 669–670.

Outbreaks of jaundice have been reported in Bombay since 1907 ; the diagnosis, however, has been on clinical grounds and lacked laboratory confirmation of leptospirosis. The case recorded here is consequently important. A patient, a male whose age and occupation are not mentioned, was taken ill suddenly with fever, shivering and general pains. When he came under the author's observation on the eleventh day of illness he was still febrile, and suffered from headache, marked prostration and jaundice. The urine contained albumen, epithelial and granular casts, leucocytes, a few red corpuscles, bile salts and bile pigments.

Examination of the patient's blood, directly by dark-ground illumination and by films, and also by culture (Vervoort's medium) and guinea-pig inoculation, proved negative. Serological tests were more fortunate. *L. icterohaemorrhagiae* was agglutinated by the serum at 1 : 160, a titre which rose rapidly and on the 34th day reached 1 : 1,000,000. A Bombay strain of rat leptospira was agglutinated in the same titre. Urine on the 36th day of illness killed a guineapig with typical signs; post-mortem changes were also typical, and its heart-blood gave a growth of leptospira. Protection experiments were confirmatory.

H. H. S.

DAS GUPTA (B. M.). **Leptospiral Jaundice in Assam.**—*Indian Med. Gaz.* 1941. Nov. Vol. 76. No. 11. pp. 668–669.

During the period June 1940–July 1941 eight cases of jaundice were observed on a certain tea estate in Assam; four of the patients died. Serum from one, suspected of suffering from infectious jaundice, was sent to the author who proved that it agglutinated *L. icterohaemorrhagiae* in a dilution of 1 : 10,000 and probably higher and reacted in low dilution (1 : 100) with *L. canicola* and an Andaman strain which was identical with a Java bat strain, known as 90G. This is said to be the first authentic case of Weil's disease reported in Assam. *H. H. S.*

MOCHTAR (A.), DE REEDE (C. A.) & RIJKEBÜSCH. Het voorkomen van nanukayami op Java. [**Nanukayami Disease in Java.**]—*Geneesk. Tijdschr. v. Nederl.-Indië.* 1941. Nov. 18. Vol. 81. No. 46. pp. 2492–2504. English summary.

Nanukayami is the local Japanese name for infection by *Leptospira hebdomadis*. During 1940 and the first half of 1941 the authors examined the sera of 467 persons in Sumatra and the Dutch East Indies and found 29 of them (6·2 per cent.) reacting in high titre with *L. hebdomadis*. Some 8 per cent. of apparently healthy workmen in Noesakambangan reacted positively in titres from 1 : 100 to 1 : 2,500. The authors give brief details of four patients in Noesakambangan, aged 35, 30, 20 and 60 years. The first was an indoor servant, the second worked on a rubber plantation, the third was in prison, the fourth was taken from the river into which he had fallen ten days before his fever started. The common symptoms were muscle pains, markedly injected conjunctiva, signs of renal irritation and fever. Their sera agglutinated *L. hebdomadis* in a dilution of 1 : 25,000; some agglutinated other leptospirae also but in a much lower titre, 1 in 25, 1 in 50, and occasionally 1 in 500. Only the fourth case recorded had any history of contact with polluted water, and that was 10 days before the onset of fever. From three of the four the leptospira was cultivated from the blood and urine in Noguchi's medium. Attempts at cultivation failed with the second patient. *H. H. S.*

MISCELLANEOUS.

MANSON-BAHR (Clinton). **Diseases of East Africa.**—*Lancet.* 1942. Feb. 14. p. 217.

Major Manson-Bahr notes that although the malaria of the area Diredawa to Awash and of the Omo river district is predominantly subtertian, there is undoubtedly benign tertian in Addis Ababa. He reports an outbreak of kala azar in a company of the King's African Rifles stationed north-east of Lake Rudolf in a completely uninhabited area where there are no natives or dogs. He has also found the disease at Garba Tulla in the Northern Frontier Province of Kenya. Louse-borne relapsing fever is very severe and has caused many deaths in native troops. Typhus in Addis Ababa is all louse-borne, but the Italians report that the case mortality is not high, being in the neighbourhood of 30 per cent. Murine typhus is reported in Southern Abyssinia and there is a record of one case of tick-borne typhus, probably contracted in Somaliland.

Bacillary dysentery was found near Mogadishu and in Addis Ababa, and amoebiasis occurs around Addis Ababa. Soft sore is the commonest venereal disease, but lymphogranuloma inguinale occurs in the Negheli region. Granuloma venereum is reported from the Gondar region and Western Abyssinia. An Italian laboratory worker states that he has not seen *Schistosoma mansoni* in Abyssinia. [See also this *Bulletin*, 1941, Vol. 38, p. 529.] *C. W.*

DENECKE (Karl). Betrachtungen ueber Häufigkeit und Verlauf von Krankheiten bei den Eingeborenen der Guineabucht (Westafrika). [**The Frequency and Course of Diseases of the Natives of the Gulf of Guinea.**]—*Arch f. Hyg. u. Bakt.* 1941. Vol. 126. No. 5/6. pp. 331–348. [30 refs.]

The author spent some years in Fernando Po and Rio Muni, and the present paper is a conspectus of the diseases seen in those parts. Skin diseases are common, especially mycoses, tropical ulcer, crawcraw, and creeping eruption due to larvae of the dog hookworm [? *Ancylostoma brasiliense* ? *A. caninum*]. Leprosy of all forms is common in Rio Muni, sporadic in Fernando Po; yaws is widely spread. Dengue, common in the Gold Coast and the Cameroons, was seen in Fernando Po, but only in Europeans. Measles is rare, smallpox is present but is declining, whooping cough was occasionally seen. Diphtheria was not encountered, but almost all persons Schick tested showed evidence of immunity, the origin of which is obscure. No scarlet fever was seen.

Of bone diseases sabre tibia, the result of yaws, is common, the nasal signs of congenital syphilis are not rare, osteomyelitis, often from tropical ulcer, is seen, and tuberculosis of the vertebrae is not uncommon. Of joint diseases, rheumatic polyarthritis is the most frequent, but the author has also seen arthritis deformans (sometimes the result of contusion), gonorrhoeal arthritis and arthritis due to yaws.

Tropical myositis is important, and occurs in natives and Europeans. Onchocerciasis and guinea worm are common, madura foot is occasionally seen, juxta articular nodes are found, and the formation of keloid, often of great thickness, is common. Various neurological diseases are reported, and the author remarks that the late results of poliomyelitis are relatively frequently seen.

There is a high incidence of sleeping sickness in Fernando Po, but it is less common in Rio Muni, except in the south-west. The author claims that the dog is a reservoir of sleeping sickness, stating that he has proved this by injection of dog blood containing trypanosomes, but gives no details of the experiment. Tetanus is not uncommon.

Of pulmonary diseases, bronchitis, bronchopneumonia, influenza and lobar pneumonia are common, and the author states that damage to the lungs by larvae of hookworms, Ascaris and Strongyloides are to be borne in mind. Pulmonary tuberculosis was rare in Fernando Po until about ten years ago, since when it has spread [but the author's remarks on the incidence of tuberculosis in Africa are curious. He states that it is rare in Sierra Leone and the Gold Coast and quotes KLEINE as remarking that in East Africa it is only found in adult natives who work on the coast or on plantations. Neither of these statements is justified].

Cardiac lesions, the result of rheumatic fever and syphilis, are found, and hookworm anaemia produces an effect on the heart sounds. Rheumatic fever is an important disease in the natives.

The enteric fevers and dysentery are not often seen, but bacteriological examination of faeces could not be carried out. Non-infectious diseases of the alimentary tract are common and are stated to be due, largely, to the use of contaminated food and water. Amoebic dysentery exists, but is not common ; intestinal flagellates are seen. Intestinal helminthic infections are reported to be somewhat rare in Rio Muni. Schistosomiasis was not seen. *A. perstans* infection was found in about half the natives examined and *L. loa* in about one-third, *W. bancrofti* is less common. Yellow fever has not been seen by the author in either Fernando Po or Rio Muni.

Venereal diseases are widespread.

Malaria is very common but immunity is acquired before adult life is reached ; blackwater fever was not seen. Most of the infections are with *P. falciparum*, but *P. vivax* is also seen. The parasite rate falls from 60–100 per cent. in infancy to a low percentage in later life.

The common snakes of Fernando Po are *Naja melanoleuca*, *Dendraspis viridis* and *Bitis gabonica*.

Enlarged lymphatic glands are common, and are due largely to trypanosomiasis, lymphogranuloma inguinale and filariasis. *C. W.*

PRASAD (Kashi). **Bored-Hole Absorption Pits.**—*Indian Med. Gaz.* 1941. Oct. Vol. 76. No. 10. pp. 627–628. With 1 fig.

The bored hole, 20 feet deep and 16 inches in diameter, is the same whether used as latrine or, as suggested by the author, as absorption pit. He points out the advantage of ease of construction, which makes the pits suitable for villages. The limitations are that they can only be made where the soil is not rocky ; they should not be placed within 4 feet of any wall, which may collapse during the rains. One pit can absorb only 10–15 gallons each day but if rainwater is not permitted to enter, it will last several years before silting makes it unusable. The walls may cave in after the reception of much water, but this may be prevented by partially filling with broken bricks, which do not interfere with absorption. A suitable top is essential, with a drain of masonry of saucer type, the spout projecting over the centre of the pit so that water falls, not on to the wall to cause erosion, but directly into the pit. Storm water should be led away from the pit if necessary by closing the

drain to the pit. The mouth of the pit should be covered to prevent children and animals from falling into it, preferably by a moveable cement slab resting in a masonry ring.

Cost of construction and details of the outfit are given. *C. W.*

FAUST (Ernest Carroll). **The Chemotherapy of Intestinal Parasites.**—*Jl. Amer. Med. Assoc.* 1941. Oct. 18. Vol. 117. No. 16. pp. 1331–1335. [31 refs.]

A general account of the treatment of certain common helminthic diseases and intestinal protozoal infections. *C. W.*

PUBLIC HEALTH REPORTS. 1940. Supplement No. 161. 8 pp. With 4 figs. on 2 plates.—**Ivy and Sumac Poisoning.**

HOFFMAN (W. A.). **The Effect of Chloroform on Some Insect Bites.**—*Science.* 1941. July 18. Vol. 94. No. 2429. p. 66.

Chloroform, rubbed briskly on mosquito bites, causes rapid cessation of the pruritis ; a similar effect was obtained with this treatment of the bites of Trombicula, Simulium and Culicoides. It is most effective when applied early but brings relief even after 48 hours. It is, of course, important to keep the chloroform away from the eyes and mucous membranes. *C. W.*

DE MEILLON (Botha) & REBÊLO (António). **Culicini (Diptera, Nematocera) from the Colony of Moçambique.**—Reprinted from *Moçambique-Documentário Trimestral.* 1941. July–Sept. No. 27. pp. 69–77.

This contains very brief statements of the frequency and distribution of the mosquitoes in the Colony of Moçambique. *C. W.*

BATES (Marston). **Laboratory Observations on the Sexual Behaviour of Anopheline Mosquitoes.**—Reprinted from *Jl. Experim. Zool.* 1941. Mar. Vol. 86. No. 2. pp. 153–173. [18 refs.]

NIÑO (Flavio L.). Miasis por larvas de "Cochliomyia hominivorax" (Coquerel, 1858), complicando un cáncer de labio. (Nota parasitológica.) [**Myiasis due to** *C. hominivorax* **Complicating Cancer of the Lip.**]—*Bol. Inst. Clin. Quirúrg.* Buenos Aires. 1941. June–July. Vol. 17. No. 141. pp. 510–522. With 10 figs. [38 refs.]

NAJERA ANGULO (Luis). Aparato para capturar Phlebotomus, Mosquitos, etc. [**A Trap for Sandflies, Mosquitoes, etc.**]—Reprinted from *Las Ciencias.* Madrid. 1940. Vol. 5. No. 2. pp. 495–500. With 6 figs.

This is a description of a trap for catching mosquitoes and sandflies, in which advantage is taken of the attraction that light possesses for certain of these insects. Constructional details are illustrated. The main body of the trap, constructed of wire gauze, measures 60 by 30 by 30 cm. In front the size of the entrance can be varied at will by the adjustment of flaps. At the back an electric bulb, 100 watts, provided with a concave reflector, is the source of illumination. In front of the bulb a flask filled with water acts as a cooler ; the water may be coloured if desired. In the bottom of the trap is a shallow tray to be

filled with a preserving fluid; the fluid recommended is 70 per cent. alcohol to which 5 per cent. of glycerin is added. *Norman White.*

SCHLEGEL (B.). Experimentelle Untersuchungen zur Besserung der Hitzeverträglichkeit des Menschen. [**Experiments on the Improvement of Heat Acclimatization in Man.**]—*Klin. Woch.* 1941. May 17. Vol. 20. No. 20. pp. 506–510. With 3 charts.

Variations in the heat regulation of the human organism have been studied, with particular reference to the water and salt losses caused by high temperatures. The experiments described in the paper were conducted at a temperature approaching 40°C. (104°F.) and beneficial effects on the heat regulating mechanism were found to result from the administration of renal cortical hormone. Under the influence of the hormone there was an increase of water delivery through the skin, with a proportional increase of salt delivery. This ability to sweat more freely tended to stabilize the circulation and thus contribute to a feeling of comfort in the subjects tested.

The experiments were timed to last for 120 minutes and in two series of tests (*a*) without and (*b*) with hormone administration, it was found that in individual cases the increase in sweat loss under the influence of the hormone was considerable, amounting to as much as 74 per cent. Six subjects were unable to continue the control experiments without hormone for the two hours and had to give up after periods ranging from 45 to 108 minutes (average 78 minutes). After receiving the hormone, however, these subjects carried out full 2-hour experiments without apparent discomfort. That this ability was due in some measure to an improvement in circulatory efficiency was shown by a comparison of pulse rates under the two conditions of experiment. Without hormone administration the pulse mounted rapidly at first and reached 140–150 per minute by the end of two hours, but with hormone the pulse was steady at 80–90 throughout the experimental period.

The effect of hormone on the peripheral blood vessels was shown by measurements of the volume fluctuations in the arms in heat experiments before and after the administration of prophylactic doses. In the control experiments the volume change for five subjects averaged 66 cc., but in the hormone experiments the volume fluctuation for the same group of subjects averaged 55 cc.

The results obtained by this work indicate that acclimatization to a hot environment may be accelerated by the use of hormone.

C. G. Warner.

EARLE (K. Vigors). **Medical Work in Nauru.**—*Med. Press & Circular.* 1942. Jan. 21. Vol. 207. No. 3. pp. 38–40.

HUFF (Clay G.). **The Influence of Host Constitution on the Parasite.**—Reprinted from *Amer. Assoc. for Advancement of Sci. Publication No. 12.* pp. 62–65. [28 refs.]

SALT (George). **The Effects of Hosts upon their Insect Parasites.**—*Biol. Reviews.* 1941. Oct. Vol. 16. No. 4. pp. 239–264. With 6 figs. [53 refs.]

REVIEWS AND NOTICES.

STRONG (Richard P.) [M.D., Sc.D., D.S.M., C.B., Professor of Tropical Medicine, Emeritus, Harvard University, etc.]. **Stitt's Diagnosis, Prevention and Treatment of Tropical Diseases.** Sixth Edition. Vol. I. pp. xv+1–871+xl. Vol. II. pp. vii + 872–1747 + xl. With 398 figs. & 4 plates (2 coloured). 1942. Philadelphia: The Blakiston Company. [Price $21.]

This timely production under the editorship of Professor R. P. Strong represents the Sixth Edition of Stitt's former "Diagnostics and Treatment of Tropical Diseases," of which the last made its appearance in 1929. It is difficult to recognize such an old friend in a new garb; it is as if Stitt had now emerged from the downy stage to fully adult plumage. Not only has the arrangement been altered, but with increasing knowledge it has expanded into two volumes, each of over 800 pages, of which the latter portion of Vol. 2 is devoted to a series of appendices (in small type) and a consideration of hygiene in tabloid form.

Classification is arranged mainly on aetiology, such as diseases due to protozoa, bacteria, viruses, rickettsiae, nutritional disorders, fungus-diseases and those caused by poisonous plants. A not inconsiderable section is devoted to animal parasites including helminths, injurious arthropods, poisonous fish, snakes and coelenterates. It will therefore be realized that the scope is ambitious and the very considerable labour in the preparation of this work will undoubtedly justify the praise which will be bestowed upon it.

To fill in details satisfactorily and accurately upon every question is probably beyond the scope of any single individual and in this respect the Editor has had the advantage of a strong backing. Dr. G. C. SHATTUCK, Clinical Professor of Tropical Medicine, Harvard University, has written the chapters on nutritional disorders and heat stroke; Dr. A. W. SELLARDS and Dr. Richard Pearson STRONG, Associate Professor of Tropical Medicine, have been responsible for the authoritative chapter on yellow fever. Dr. J. H. SANDGROUND has supervised parasitology, Dr. J. C. BEQUAERT has filled a similar office in entomology, and so on. It is small wonder that with such well-known names a high standard of accuracy has been reached in every direction. The whole work repays ample study and there is much here for envy and emulation, and its importance to students, practitioners and research workers in tropical medicine alike justifies a close and critical scrutiny. Malaria is treated in a detailed manner, unsurpassed in any other medical publication. We note that *Plasmodium knowlesi* is included as a parasite of man on account of its therapeutic application and the chapter is so comprehensive as to include allied plasmodial infection of animals, but may be criticized on grounds that undue consideration for the apparently valueless Henry's reaction occupies no less than one and a half pages.

In logical succession this chapter concludes with a full account of the morphology and life history of Anopheles, a very considerable space being devoted to prophylaxis (a subject which will be referred to later) and the essentials of therapeutically induced malaria. The chapter on blackwater fever may be regarded as a modern detailed account of this puzzling catastrophe. African trypanosomiasis is singularly complete and well illustrated by distributional maps. A feature of the chapter

on leishmaniasis is the full consideration given to pathological appearances and histology with good illustrations of the lesions. In treatment no mention is made of the striking recent successes of diamidinostilbene.

Leptospirosis is a rapidly changing subject. In one breath the identity is admitted of *L. grippotyphosa* and *L. icterohaemorrhagiae*, but later it is suggested that they are distinct and, furthermore, that the seven-day fever of Australia is due to *L. pomona*, that of Japan to *L. hebdomadis* and the paradengue of Deli to *L. febrilis* (in parenthesis it may be added that Deli is in Sumatra : not in Java). In the Yaws section Dr. STRONG proves himself a worthy dualist (though in the heat of the controversy this word might have had a different spelling and application) ; but visceral vascular lesions are recognized as part and parcel of an uncomplicated infection with *S. pertenuis*.

Pinta is frankly acknowledged as a treponematosis and is illustrated by good plates of *Treponema carateum*, as well as by photographic illustrations of reproduction of this disease by inoculation.

The section on amoebiasis is very thorough and complete and we note that the use of intravenous emetine is discouraged. In the therapy of bacillary dysentery due credit is given to the modern application of sulphaguanidine. Cholera, too, is adequately handled. The chapters on plague and tularaemia can be singled out for the excellence of the clinical illustrations and of the postmortem appearances in animals. In leprosy we have a masterly account and in differential diagnosis due emphasis is laid on its distinction from tuberculosis, naso-oral leishmaniasis and syringomyelia. No special line of treatment is strongly advocated, all are detailed on the basis of "pay your money and take your choice."

Volume II opens with a truly excellent account of yellow fever. The Rickettsia group receives generous treatment and includes trench fever, the product mainly of the American Trench Fever Commission in 1918, which for the first time is admitted to the hierarchy of Tropical Medicine. The whole group occupies a space of some 73 pages and includes a description of the transmitting agents, which again are treated at length in Chapter L, which is solely devoted to arthropods. We may note the excellent photographic illustrations of rashes so distinctive of this group, there are good pictures, too, of verruga peruviana and Oroya fever, a subject which the editor has made particularly his own ; in treatment, claims made by KIKUTH for his arsenic-antimony compound S.D.T. 356 B are not substantiated.

Section IV deals with nutritional disorders and in the opening chapter on nutritional oedema there appears to be some confusion with epidemic dropsy, which is, however, later given full status as mustard-oil poisoning on p. 1210. Sprue is frankly classified as a nutritional disease and this chapter may be regarded as the most disappointing in the whole work—occupying only 14 pages without illustrations ; this surely suggests some lack of balance when one compares it with S. American trypanosomiasis in Vol. I—a comparatively unimportant subject from the clinical aspect—which is profusely illustrated and occupies a full 20 pages. Hill diarrhoea is frankly admitted as an incipient stage of sprue.

Beriberi and pellagra, to which 17 pages apiece are devoted, are given full consideration, but a curious omission is the absence of all mention of secondary avitaminosis which has assumed such an important rôle in general medicine.

Onyalai, p. 1134, is included as a disease of doubtful origin, but is acknowledged as essential thrombocytopenia ; no mention is made of W. K. BLACKIE's important contribution in S. Rhodesia (1937, *Trans. Roy. Soc. Trop. Med. & Hyg.*, Vol. 31, p. 207).

As might be expected in an American work, blastomycosis is authoritatively treated and magnificently illustrated with coccidiomycosis, rhinosporidiosis, histoplasmosis and torulosis in its train. Chapter XLII is devoted to poisonous plants and is undoubtedly the best account in any text-book. Section VII is on animal parasites, and embraces helminths, injurious arthropods, numerous fish and coelenterates, but undue attention appears to be paid to the rarer nematode and cestode infections which have been recorded from time to time. On p. 1332 the important discovery of the adult *Wuchereria malayi* by RAO & MAPLESTONE has been missed.

Chapter LIII, a table of important animal parasite diseases, is necessarily a repetition in tabloid form of much which has gone before, but is doubtlessly of value to students preparing for an examination who appreciate such a synopsis.

Chapter LIV, a particularly full story of medical practice in the tropics, arranged alphabetically, contains lessons of practical import, but which in reality becomes a synopsis of general medicine and is grossly overloaded. The anaemias in themselves are inexhaustible and take up seven pages. On p. 1593 we may note that an old friend " Bronchial Spirochaetosis " once more raises its unworthy head.

The Appendix occupies 84 pages of closely set small type. Section I is an index of clinical and Section II of laboratory diagnosis which involve reiteration and are hardly separable. Both are arranged in alphabetical order and can be regarded almost as a glossary of disease. Section III on tropical hygiene is a text-book in itself, and we may note the informative chapter on climatology, which on p. 1736 embraces even instruction on behaviour of Europeans in control of native tropical races.

The arrangement of this book has necessarily produced a great deal of reiteration, much of which appears unnecessary. We have animadverted on the chapter on sprue, a subject which is considered under anaemia, p. 1577, again the blood picture is described on p. 1625, under diarrhoea p. 1630, under faeces p. 1636, under urine p. 1642, under intestinal tract p. 1643, under index of clinical diagnosis p. 1664 and under gastric analysis and blood chemistry on p. 1684. Some of these accounts of the same disease are contradictory as for instance on p. 1636, where it states that the sprue stool shows an increase in neutral fats (which is incorrect) as compared to the more or less correct accounts on p. 1664 and p. 1684. This would appear to have been occasioned by the fact that the Index of Clinical Diagnosis in the Appendix has been lifted bodily from the Fifth Edition of Stitt (1929) with but few minor alterations and contains the same inaccuracies.

Mosquitoes are split up under many small sections, firstly under malaria transmission pp. 29–44, prophylaxis pp. 117–123 (mainly Anopheles), also in a second account under arthropods in transmission of disease pp. 1523–1529, again, pp. 1734–1735, as regards prophylaxis in tropical hygiene, pp. 1744 & 1745 on general measures for mosquito destruction and yet again on p. 1746 with special reference to aircraft. Parcelled out in this manner this is surely a matter of confusion for the student, but is bound to happen when the principle of devoting a

whole section to all the methods ancillary to clinical medicine is abandoned.

Proof reading has been assiduously carried out and typographical errors are singularly few and unimportant. It is worth noting on p. 1715 that Grabham carried out his research on heat absorption by coloured paints at Wady Halfa (Sudan), not Haifa as stated (ref. (1921) *Jl. Hygiene*, Vol. 19, p. 245).

Lists of references (which are unfortunately quite incomplete) are included at the close of each chapter. The wisdom of including them at all in a text-book is more than questionable. The index is all sufficient.

There are two excellent coloured plates and one in black and white of malaria parasites. The text-figures mostly reach a high standard. The format of this work leaves nothing to be desired; the cover is made of weather- and insect-proof washable material; type and paper are of best quality.

This treatise must now be awarded the premier place amongst modern text-books devoted to this subject and is indeed a veritable monument to that Nestor of Tropical Medicine—Professor R. P. Strong—under whose wise guidance we trust (as his name denotes) that it may progress from strength to strength for many years to come.

Generous references are made to the work of the London School of Hygiene and Tropical Medicine, the Hospital for Tropical Diseases, and the Bureau of Hygiene and Tropical Diseases.

Philip Manson-Bahr.

CULBERTSON (James T.) [Assistant Professor of Bacteriology, College of Physicians and Surgeons, Columbia University]. **Immunity against Animal Parasites.**—pp. viii+274. With 4 figs. (2 on 2 plates) & 3 charts. 1941. New York: Columbia University Press, Morningside Heights. [21*s*.]

The author takes the year 1929—the date of Taliaferro's "The Immunology of Parasitic Infections"—as his starting point for a further review of the subject. In only a few cases has this date limit been disregarded, when the author wishes to emphasize some particular point; for example, the work of Smith and Kilborne in 1893 is mentioned as the first clear demonstration of acquired immunity in an infection by an animal parasite.

The subject matter of the book is dealt with in three parts. The first part deals with natural resistance, age resistance, specifically acquired immunity, the requisites for immune response, parasites which elicit immunity, mechanism of specific immunity, and the demonstration of immunity. Part two comprises immunity in specific diseases, the amoebiases, leishmaniases, trypanosomiases, malarias, coccidioses, trematodiases, cestodiases, nematodiases, and the response to arthropods. Part three, entitled Applied Immunology, includes chapters on the classification of parasites, vaccination against them and the diagnosis of parasitic infection.

Human beings have a natural immunity from infection by *Trypanosoma lewisi* or by the larval stage of *Taenia saginata*. So far as we know man has little natural immunity from infection with *Leishmania tropica*, but he can acquire immunity.

Immunity from reinfection with coccidia is absolute and does not require the persistence in latent form of an infection with the parasite. Other instances given of complete acquired immunity are the resistance exhibited by rats which have recovered from *T. lewisi* and of mice which have recovered from *T. duttoni* infections.

Texas fever was the first parasitic disease in which resistance to subsequent infection was shown to depend on the continued presence of the parasite in latent form in the blood and the fixed tissues of the host (premunition). The word " premunition " occurs very frequently in this treatise on parasitic infections.

The author writes " The term ' premunition ' was proposed by Sergent in 1924 to describe a form of resistance which depends on the mutual tolerance of the host and parasite." Again, " Cattle acquire a tolerance of the parasite if treated early with suitable drugs, and thereafter survive for long periods in endemic areas in spite of reinfection."

It is difficult to see what advantage is obtained by using the word " premunition " in place of the older expression " tolerance." The term " premunition," as shown above, is constantly defined in terms of " tolerance," and the more it is so defined the more it appears to be identical with " tolerance."

Instances of " premunition " given are the resistance possessed by man infected with amoebiasis, that by cattle with *Trypanosoma brucei* or *T. congolense* and that by negroes in the tropics with malaria infections.

Certain intestinal helminthiases appear at first sight to offer examples of " premunition," in so far as it is not easy to add to the existing infection. But that this state may not necessarily be due to " premunition," with production of antibody, is suggested by the fact that an animal which has been cured by an anthelminthic can be reinfected immediately. The freedom from added infection in such cases may be attributed to causes other than resistance following antibody production ; it may be put down to lack of sufficient space and food to support more parasites. A similar cause, it is suggested, may account for the facts that a second infection with Ascaris or hookworm is seldom superimposed on one already existing, and that reinfection usually occurs promptly when the adult stages are removed by anthelmintics.

Some larval cestodes which invade somatic tissues present a difficulty, since they are not dislodged while the host lives. The resistance to further infection shown by the infected animals could be attributed to " premunition." There is, however, experimental evidence, commencing with the well-known work of Miller, which proves that immunity can develop as the result of such infections. Rats which had become infected with the cysticerci of *Taenia crassicollis*, and from which all the cysticerci had later been surgically removed, were shown to remain immune to reinfection for a period of at least two months.

Parasite antigen can often be detected in the early stages of acute parasitic infections ; antibody in the later stages (second and third weeks) of acute infections, and also in chronic ones. The amount of absorption of antigen from parasites in the alimentary canal usually depends on the degree of invasion of the mucosa by the parasites. In the case of adult tapeworms such as *Taenia saginata*, attached superficially, the absorption is so low that tests applied to the blood serum of the host for the presence of antigen and antibody give poor results. The author emphasizes the fact that parasites contain many antigens,

and that some of these occur in parasites other than that with which the host is infected. The reaction between antigen and antibody which results when antigen from such extraneous parasites reacts with the serum of the animal being examined—a group reaction—is not properly described as non-specific. It is specific, the antibody present combines only with its own specific antigen, though the latter may occur in species or even genera of parasites other than the one which is infecting the animal.

The test for antigen has been employed in malaria, trypanosomiasis and leishmaniasis. Trichiniasis in rabbits and Haemonchus infection of sheep can also be diagnosed by the presence of antigen in the serum of the infected animal early in the infection. The tests for the presence of antibody have had wider application: they are directed towards the discovery of (1) Agglutinin—in malaria, leishmaniasis and trypanosomiasis. For this test in helminthiasis the use of suspensions of finely divided particles of helminth bodies is suggested. (2) Precipitin—this can be detected in some protozoal diseases, and in numerous helminth infections. (3) Complement fixing antibody—complement fixation is the most delicate test for antibody in protozoal and helminth infections. (4) Adhesin—the test for adhesin is so far of less practical utility than the others. (5) Skin tests—these are the simplest to perform of all the diagnostic tests for helminthiasis; they become positive by the second or third week after infection. The antigens may be almost universally present in a group of parasites, *e.g.* practically any species of cestode will yield antigen for the skin test in Echinococcus infection; an extract of any schistosome will serve for the skin test in human schistosomiasis; an extract of *Dirofilaria immitis* or *Contortospiculum rheae* reveals infection with any of the human filariae. The reactions, however, are most intense with antigens from the homologous parasite. Either adult or larval stages can be the source of the skin-testing antigen, the antigenic constitution of adult and larva being the same.

The volume is excellently printed on good paper, notable considerations at the present time. Each reference to an author is given below the text on the same page. The convenience of this arrangement more than compensates for the repetition of some references in other sections.

This book will be of great practical value not only to all research workers in the field of parasitology, but also to those who are concerned with the diagnosis, treatment and prevention of parasitic diseases. *D. B. Blacklock.*

BROOM (J. C.) [M.D., Bacteriologist to the Wellcome Bureau of Scientific Research, London]. **Aids to Tropical Medicine.** 4th Edition, Revised.—pp. viii+203. With 30 figs. & frontispiece of 7 figs. 1942. London: Baillière, Tindall & Cox, 7 & 8 Henrietta Street, Covent Garden, W.C.2. [5*s*.].

The greater part of this book has been re-written as a consequence of the advances made in the knowledge of tropical medicine since the last edition was published in 1927. The re-writing is evidently the work of an expert, and the amount of accurate information given in so small a space is astonishing. The diseases are grouped according to their causes—viruses, bacteria, protozoa, etc.—and there is a short section on medical entomology and a final chapter on the technique of blood and faeces examination.

In a book of this length it is obvious that there is no room for discussion, and that statements must be dogmatic. Criticism on the level of that which would be adopted in the case of a full text-book is therefore unjustified. For its purpose, that of a student's notebook, the book does very well, but although much has been included, much has inevitably been left out. In the section on medical entomology, which occupies 20 pages, there is a key to many of the genera of the Pulicidae, giving greater detail than the book would seem to require. Although Stomoxys is described at some length, there is no account of the bionomics of *Glossina morsitans*. In this section the information, therefore, is somewhat unbalanced. It might be an improvement to eliminate this section altogether, and to utilize the space for amplification of purely medical information.

Some of the illustrations are excellent ; others give little information.

C. W.

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BULLETIN OF WAR MEDICINE.

The attention of readers of the *Tropical Diseases Bulletin* is drawn to a new publication entitled the *Bulletin of War Medicine*, issued by the Medical Research Council, edited and prepared by the staff of the Bureau of Hygiene and Tropical Diseases, and published by H.M. Stationery Office.

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